

APPENDIX NOT INCLUDED

REDACTED VERSION

APPENDIX B STATEMENT OF WORK
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
U.S. OIL RECOVERY SITE – AREA OF INVESTIGATION-1
PASADENA, TX



9828284

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APPENDIX B
STATEMENT OF WORK
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
AREA OF INVESTIGATION-1
US OIL RECOVERY SITE
PASADENA, HARRIS COUNTY, TEXAS

1. INTRODUCTION

1. This Statement of Work (SOW) provides an overview of work that will be carried out by respondents as they implement a Remedial Investigation and Feasibility Study (RI/FS) for the US Oil Recovery Site (USOR) Area of Investigation-1 (AOI-1). This RI/FS SOW is attached to the Administrative Order on Consent (AOC) for Remedial Investigation/Feasibility Study for AOI-1 and is a supporting document for the AOC. Technical work described in the SOW is intended to provide more information to Respondents for purposes of implementing the AOC and is not intended to change the meaning of any AOC language. This SOW is also consistent with both the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the National Contingency Plan (NCP). Any discrepancies between the AOC and SOW are unintended, and whenever necessary, the AOC will control in any interpretive disputes.

2. The RI/FS is expected to be an iterative process. This SOW outlines a decision process that will be used to focus sampling programs to gather data that are needed for the decision process. The U.S. Environmental Protection Agency (EPA) understands there may be concern on the part of Respondents that such an iterative process could lead to substantial increases in the size, cost, and scope of the RI/FS. However, EPA has an obligation under CERCLA to protect human health and the environment wherever hazardous substances have been discharged or migrated in the environment. To balance these competing interests, EPA's Office of Solid Waste and Emergency Response is promoting more effective strategies (i.e., Triad Approach) for characterizing, monitoring, and cleaning up hazardous waste sites. The Triad Approach integrates systematic planning, dynamic work plans, and on-site analytical tools used to support decisions about hazardous waste sites. Additional information regarding the Triad Approach is attached and can be found at the following website: http://www.clu-in.org/conf/tio/triad_012303.

3. The purpose of the RI/FS is to investigate the nature and extent of contamination for AOI-1, to assess the potential risk to human health and the environment, to develop and evaluate potential remedial action alternatives, and to recommend a preferred alternative. The RI and FS are interactive and will be conducted concurrently, to the extent practicable in a manner that allows information and data collected during the RI to influence the development of remedial alternatives during the FS, which in turn affect additional information and data needs and the scope of any necessary treatability studies and risk assessments.

4. Respondents will conduct the RI/FS and will produce draft RI and FS reports that are in accordance with the AOC. The RI/FS will be consistent with the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (U.S. EPA, Office of Emergency and Remedial Response, October 1988) Data Quality Objectives (DQOs) planning process (EPA QA /G-4. August

2000), and other applicable guidance that EPA uses in conducting an RI/FS (a list of the primary guidance is attached), including potentially applicable guidance released by EPA after the effective date of this SOW. EPA is aware that not all RI/FS guidances may be applicable to AOI-1. EPA Project Managers for sites have the authority under the NCP to determine when application of any guidance would be inappropriate. Respondents may raise such guidance issues they consider pertinent during the implementation of the AOC. EPA's decisions regarding guidance applicability will be incorporated into document approval correspondence or in other written correspondence as appropriate.

5. The RI/FS Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA describes the suggested report format and content for the draft RI and FS reports. Respondents will furnish all necessary personnel, materials, and services needed for, or incidental to performing the RI/FS, except as otherwise specified in the AOC.

6. At the completion of the RI/FS, EPA will be responsible for the selection of an AOI-1 remedy and will document this selection in one or more Records of Decision (RODs). The response action alternatives selected by EPA will meet the cleanup standards specified in Section 121 of CERCLA, 42 U.S.C. § 9621; the selected remedy will be protective of human health and the environment, will be in compliance with, or include a waiver of, applicable or relevant and appropriate requirements (ARARs), will be cost-effective, will utilize permanent solutions and alternative treatment technologies or resource recovery technologies, to the maximum extent practicable, will incorporate sustainability considerations, and will address the statutory preference for treatment as a principal element, as appropriate under the NCP. The final RI/FS report, as approved by EPA, will, with the administrative record, form the basis for the selection of AOI-1's remedy and will provide the information necessary to support development of one or more RODs.

As specified in Section 104(a)(I) of CERCLA, 42 U.S.C. § 9604(a)(I), EPA will provide oversight of Respondents' activities throughout implementation of the AOC. Respondents will support EPA's initiation and conduct of activities related to implementation of oversight activities.

Purpose of the Statement of Work

7. This SOW sets forth certain requirements of the AOC for implementation of the Work pertaining to the RI/FS for AOI-1. The Respondents shall undertake the RI/FS according to the AOC, including, but not limited to, this SOW and the attached Scope of Work.

Objectives of the Remedial Investigation/Feasibility Study

8. The objectives of the RI/FS are to investigate the nature and extent of contamination at or from AOI-1 and to develop and evaluate potential remedial alternatives, in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA, 42 U.S.C. § 9601, et seq.); as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA); and in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan (NCP)). Specifically, these objectives are to determine the presence or absence, types, and quantities (concentrations) of contaminants; mechanism of contaminant release to pathway(s); direction of pathway(s) transport; boundaries of source(s) and pathway(s); and environmental/public health receptors.

Scope of Remedial Investigation and Feasibility Study

9. The general scope of the RI/FS shall be to address all contamination at AOI-1 resulting from the hazardous substances present at AOI-1.

Description of the Site

10. AOI-1 of the USOR Site is located at 400 N. Richey Street, north of Highway 225, in Pasadena, Texas. U.S. Oil Recovery previously conducted operations at AOI-1, where it received municipal and industrial Class I and Class II wastewater, characteristically hazardous waste, used oil and oily sludges, and municipal solid waste. . In an initial response action, the Environmental Protection Agency (EPA) took steps to contain off-site migration, mitigate the threat to the public and to Vince Bayou, and stabilize AOI-1 in July 2010, November 2010, and January 2011. As part of those efforts, more than 800,000 gallons of non- hazardous oily liquid waste were transported off-site. Hazardous and non-hazardous sludges open to the elements and contaminating storm water were removed and also disposed off-site.

11. Pursuant to an Administrative Order on Consent, dated August 25, 2011, EPA has continued to protect the public health, welfare and the environment, including Vince Bayou, by overseeing subsequent Site stabilization activities performed by some of the Potentially Responsible Parties (known as the “PRP Group”). Stabilization activities have included Site security patrols, regular inspections of freeboard in secondary containment areas and truck bays, and pump down/removal of liquids as necessary to prevent releases from those areas. As part of those efforts, more than 750,000 gallons of non- hazardous oily liquid waste have been transported off-site for disposal from AOI-1. The PRP Group also obtained a State-Court appointment of a Receiver with legal custody and control over the AOI-1 property. Part of the Receiver’s role is to assist the PRP Group in its performance of the EPA-required actions at AOI-1. The PRP Group will continue on-going stabilization efforts under EPA oversight as needed to protect the public health, welfare and the environment, including Vince Bayou.

II. PERFORMANCE STANDARDS

12. The Performance Standards for this RI/FS shall include substantive requirements, criteria, or limitations which are specified in the AOC, including, but not limited to, this SOW. Submissions approved by the EPA are an enforceable part of the AOC: consequently, cleanup goals and other substantive requirement, criteria, or limitations which are specified in EPA-approved submissions are Performance Standards. The EPA will use the Performance Standards to determine if the work, including, but not limited to, the RI/FS, has been completed. The Respondents shall ensure that the RI/FS is consistent with the EPA’s “Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA” (EPA 1988b, hereinafter “the RI/FS guidance”) and other applicable sections of EPA guidance cited herein. If the EPA approves a schedule for any work subsequent to execution of the AOC, the revised schedule shall supersede any timing requirements established in the AOC. In the event there is a conflict between terms of the AOC and any of the other Performance Standards, the terms of the AOC will control. For example, on page B-2, the RI/FS guidance says that the Field Investigation is complete when the contractors or subcontractors are demobilized from the field; however, if the EPA, pursuant to the AOC, requires the Respondents to perform additional field investigation activities once the contractors or subcontractors have demobilized, the Respondents shall remobilize the contractors or subcontractors and perform the additional work.

III. ROLE OF THE EPA

13. The EPA's approval of deliverables, including, but not limited to, submissions, allows the Respondents to proceed to the next steps in implementing the Work of the RI/FS. The EPA's approval does not imply any warranty of performance, nor does it imply that the RI/FS, when completed, will function properly and be ultimately accepted by the EPA. The EPA retains the right to disapprove submissions during the RI/FS. The EPA may disapprove deliverables including, but not limited to, submissions concerning such matters as the contractor selection, plans and specifications, work plans, processes, sampling, analysis and any other deliverables within the context of the AOC. If a submission is unacceptable to the EPA, the EPA may require the Respondents to make modifications in the submission, and the EPA may require the Respondents to do additional work to support those modifications. That is, if a submission reports certain work that is unacceptable to the EPA, the EPA may require the Respondents to modify the submission text and to perform the work until it is acceptable to the EPA. The Respondents shall modify the submission and perform the work as required by the EPA.

IV. RESPONDENTS' KEY PERSONNEL

Respondent's Project Coordinator

14. When necessary, as determined by the EPA, the EPA will meet with the Respondents and discuss the performance and capabilities of the Respondent's Project Coordinator. When the Project Coordinator's performance is not satisfactory, as determined by the EPA, the Respondents shall take action, as requested by the EPA, to correct the deficiency. If, at any time, the EPA determines that the Project Coordinator is unacceptable for any reason, the Respondents, at the EPA's request, shall bar the Project Coordinator from any work under the AOC and give notice of the Respondent's selected new Project Coordinator to the EPA.

Respondent's Quality Assurance Manager

15. Oversight, including, but not limited to confirmation sampling, by the Respondent's Quality Assurance Manager (QA Manager) will be used to provide confirmation and assurance to the Respondents and to the EPA that the Respondents are performing the RI/FS in a manner that will meet the Performance Standards. The QA Manager shall ensure that the work performed by the Respondents meets the standards in the Quality Assurance Project Plan described in this SOW. The QA Manager shall selectively test and inspect the work performed by the Respondents.

V. TASKS TO BE PERFORMED AND DELIVERABLES

Conduct of the Remedial Investigation and Feasibility Study

16. This SOW, in addition to the attached Scope of Work, specifies the Work to be performed and the deliverables which shall be produced by the Respondents. The Respondents shall conduct the RI/FS in accordance with this SOW, and the attached Scope of Work, and all applicable guidance that the EPA uses in conducting RI/FS projects under CERCLA, as amended by SARA, as well as any additional requirements in the AOC. The Respondents shall furnish all necessary personnel, materials, and services

necessary for, and incidental to, performance of the RI/FS, except as otherwise specified in the AOC or SOW.

Submittal of Deliverables

17. All draft and final deliverables specified in this SOW shall be provided in hard and/or electronic (specifically, Microsoft® Word and Adobe® PDF format) versions (deliverable and quantity of copies will be specified by the RPM prior to document issuance), by the Respondents, to the EPA, EPA's RI/FS Oversight Contractor, Texas Commission on Environmental Quality (TCEQ), and the Federal/State Natural Resource Trustees¹ (except for bi-monthly status reports, which will be provided to EPA only and in electronic format only). Final deliverables shall be provided in hard copy and electronic format (specifically, Adobe® PDF format) to the Information Repository established for the Site. The EPA shall be responsible for placing the required deliverables into the Information Repository. The Respondents shall provide the EPA with any other documentation for the Information Repository as requested by the EPA's Remedial Project Manager. Additionally, all deliverables specified in this SOW shall be submitted, by the Respondents, according to the requirements of this SOW and Appendix A of this SOW (Schedule of Deliverables/Meetings), as amended through the RI/FS process. In addition to the Deliverables identified in Appendix A, Respondents shall provide to EPA an updated database with the bi-monthly status report for reporting periods in which validated data and maps have been uploaded to the database.

Development of Deliverables

18. All deliverables shall be developed in accordance with the guidance documents listed in Appendix B² (Guidance Documents) to this SOW. Subject to the provisions regarding EPA Approval of Plans and other Submissions in Section X of the AOC, if the EPA disapproves or requires revisions to any of these deliverables, in whole or in part, the Respondents shall submit to the EPA, within sixty (60) days after completing discussion of EPA's directions or comments on the deliverable (and in no event later than ninety (90) calendar days after receiving EPA's comments or directions on the deliverable), revised plans which are responsive to such directions or comments.

Tasks to be Performed by the Respondents

19. The Respondents shall perform each of the following Tasks (Tasks 1-10) as specified in this SOW. These Tasks shall be developed in accordance with the guidance documents listed in Appendix B² (Guidance Documents) to this SOW and any additional guidance applicable to the RI/FS process.

¹The Federal/State Natural Resource Trustees for the Site have been identified as the U.S. Department of Interior, U.S. Fish and Wildlife Service, United States Geological Survey, Texas Commission on Environmental Quality, Texas Parks and Wildlife Department, and Texas General Land Office.

²Appendix B of this SOW does not include all guidance documents that are applicable to the RI/FS for the Site. The Respondents should consult with EPA's Remedial Project Manager for additional guidance and to ensure that the guidance documents have not been superseded by more recent guidance.

Task 1: Scoping

20. The purpose of Task 1 (Project Planning) is to determine how the RI/FS will be managed and controlled. The following activities shall be performed by the Respondents as part of Task 1.

- a) The Respondents shall contact the EPA's Remedial Project Manager within fourteen (14) calendar days after the effective date of the AOC to schedule a scoping phase meeting or conference call.
- b) The Respondents shall compile, review, and evaluate all existing Site data. The Respondents shall refer to Table 2-1 (Data Collection Information Sources) of the RI/FS Guidance for a list of data collection information sources. The Respondents shall exhaust, as necessary, all of those sources in compiling the data.

The Respondents shall compile all existing information describing hazardous substance sources, migration pathways, and potential human and environmental receptors. The Respondents shall compile all existing data relating to the varieties and quantities of hazardous substances released at or from the Site. The Respondents shall compile and review all available data relating to past disposal practices of any kind on and near the Site. The Respondents shall compile existing data concerning the physical and chemical characteristics of the hazardous substances, and their distribution among the environmental media (ground water, soil, surface water, sediments, and air) on and near the Site.

The Respondents shall compile existing data which resulted from any previous sampling events that may have been conducted on and near AOI-1. The data will be reviewed for QA/QC purposes to assess if the data are reliable and able to be utilized in the RI/FS process. If the data are deemed not to be usable, the data will only be used to provide general information on the location, depth, and analytical laboratory results; which will provide assistance in selection of future sample locations. The Respondents shall gather existing data which describes previous responses that have been conducted on and near AOI-1 by local, state, federal, or private parties.

The Respondents shall gather existing information regarding geology, hydrogeology, hydrology (including floodplains), meteorology (including previous hurricane activity), and ecology of AOI-1. The Respondents shall gather existing data regarding background ground water, background soil, background surface water, background sediments, and background air characteristics (if necessary). These data will be reviewed for QA/QC purposes to assess if the data are reliable and able to be utilized in the RI/FS process. If the data are deemed not to be usable, the data will only be used to provide general information on the location, depth, and analytical laboratory results; which will provide assistance in selection of future sample locations. The Respondents shall gather existing data regarding demographics, land use, property boundaries, and zoning. The Respondents shall gather existing data available electronically via online databases (i.e., Texas Water Development Board, Texas Commission on Environmental Quality, and Texas Department of Licensing and Regulation), which identifies and locates residential, municipal, irrigation, or industrial water wells located within 1-mile of AOI-1. The Respondents shall gather existing data which identifies surface water uses for areas surrounding AOI-1 including, but not limited to,

downstream of AOI-1. The Respondents shall gather existing information describing the flora and fauna of AOI-1. The Respondents shall gather existing data regarding state and federally listed threatened, endangered, or rare species; sensitive environmental areas; or critical habitats on and near AOI-1. The Respondents shall compile any existing ecological assessment data. This may include, but is not limited to, results of acute or chronic toxicity tests using AOI-1 surface water and/or sediment, analysis of invertebrate and/or fish tissue concentrations, analysis of wildlife tissue and egg concentrations, and any wildlife or invertebrate census or community survey information.

The Respondents shall use data compiled and reviewed to describe additional data needed to characterize AOI-1, to better define potential ARARs, and to develop a range of preliminarily identified remedial alternatives. All previously collected data shall be reviewed to determine compliance with the data quality requirements for the project and that it is suitable for use in the RI/FS.

Respondents and EPA have developed the Technical Scope of Work included as Appendix D to this SOW to address some, but not all, of the above Task 1 requirements. This appendix will be used to prepare the Draft RI/FS Work Plan as required in Task 2 below, but the appendix is not intended to replace or supersede the RI/FS Work Plan.

Task 2: Remedial Investigation and Feasibility Study Work Plan

21. The Respondents shall prepare and submit a Draft RI/FS Work Plan (WP) within sixty (60) calendar days after the Scoping Phase Meeting or conference call. The Respondents shall use information from appropriate EPA guidance and technical direction provided by the EPA's Remedial Project Manager as the basis for preparing the Draft RI/FS WP. The RI/FS shall be conducted in a manner that minimizes environmental impacts in accordance with the EPA's Principles for Greener Cleanups (EPA 2009a.) and EPA Region 6 Clean and Green Policy (EPA 2009b.) to the extent consistent with the National Contingency Plan (NCP), 40 CFR Part 300. The Best Management Practices available at <http://www.cluin.org/greenremediation/> shall be considered.

22. The Respondents shall develop the Draft RI/FS WP in conjunction with the Draft RI/FS Sampling and Analysis Plan (Task 3 (RI/FS Sampling and Analysis Plan)) and the Draft RI/FS Health and Safety Plan (Task 4 (RI/FS Health and Safety Plan)), although each plan may be submitted to the EPA under separate cover. The Draft RI/FS WP shall include a comprehensive description of the Work to be performed, the methodologies to be utilized, and a corresponding schedule for completion. In addition, the Draft RI/FS WP shall include the rationale for performing the required activities.

23. Specifically, the Draft RI/FS WP shall present a statement of the problem(s) and potential problem(s) posed by AOI-1 and the objectives of the RI/FS. Furthermore, the Draft RI/FS WP shall include a background summary setting forth a description of AOI-1 which includes the geographic location of AOI-1, and to the extent possible, a description of the AOI-1's physiography, hydrology, geology, and demographics; AOI-1's ecological, cultural and natural resource features; a synopsis of AOI-1 history and a description of previous responses that have been conducted at AOI-1 by local, state, federal, or private parties; and a summary of the existing data in terms of physical and chemical characteristics of the contaminants identified, and their distribution among the environmental media at the

Site. In addition, the Draft RI/FS WP shall include a description of AOI-1 management strategy developed during scoping, and a preliminary identification of remedial alternatives and data needs for evaluation of remedial alternatives. The Draft RI/FS WP shall reflect coordination with treatability study requirements (Task 8 (Treatability Studies)), if any, and will show a process for and manner of identifying Federal and State chemical-, location-, and action-specific ARARs.

24. Finally, the major part of the Draft RI/FS WP shall be a detailed description of the Tasks (Tasks 1-10) to be performed, information needed for each Task and for the Baseline Human Health and Ecological Risk Assessments, information to be produced during and at the conclusion of each Task, and a description of the Work products and deliverables that the Respondents will submit to the EPA. This includes the deliverables set forth in the remainder of this SOW; a schedule for each of the required activities which is consistent with the EPA's guidance documents; bi-monthly reports to the EPA as specified in Appendix A (Schedule of Deliverables/Meetings); and meetings and presentations to the EPA at the conclusion of each major phase of the RI/FS. The Respondents shall refer to the EPA's guidance document entitled, "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988b) which describes the suggested RI/FS WP format and content.

25. The Respondents are responsible for fulfilling additional data and analysis needs identified by the EPA consistent with the general scope and objectives of this RI/FS. Because of the nature of AOI-1 and the iterative nature of the RI/FS, additional data requirements and analyses may be identified throughout the process. If any significant additional Work is required to meet the objectives stated in the RI/FS WP, based upon new information obtained during the RI/FS, the Respondents shall submit a Draft RI/FS WP Refinement/Modification Notice to the EPA for review and approval prior to any additional Work being conducted in accordance with the AOC and SOW. The EPA may, at its discretion, give verbal approval for Work to be conducted prior to providing written approval of the Draft RI/FS WP Refinement/Modification Notice.

26. Subject to the provisions in Section X of the AOC, the Respondents shall prepare and submit to the EPA a final RI/FS Work Plan within sixty (60) calendar days after completing discussion of EPA's comments on the draft RI/FS Work Plan (and in no event later than ninety (90) calendar days after receipt of the EPA's comments on the draft RI/FS Work Plan).

Task 3: RI/FS Sampling and Analysis Plan

27. The Respondents shall prepare and submit to the EPA a Draft RI/FS Sampling and Analysis Plan (SAP) within sixty (60) calendar days after the Scoping Phase Meeting or conference call. This Draft RI/FS SAP shall provide a mechanism for planning field activities and shall consist of an RI/FS Field Sampling Plan and Quality Assurance Project Plan as follows:

- a) The RI/FS Field Sampling Plan (FSP) shall define in detail the sampling and data gathering methods that will be used for the project to define the nature and extent of contamination and risk assessment-related studies (Task 7, Risk Assessments). It shall include, but not be limited to, sampling objectives, sample location and frequency, sampling equipment and procedures, and sample handling and analysis. The RI/FS FSP shall contain a completed Sample Design Collection Worksheet and a Method Selection Worksheet. These worksheet templates can be found in the EPA's guidance document entitled, "Guidance for Data Useability

in Risk Assessment” (EPA 1992a). In addition, the FSP shall include a comprehensive description of the Site including geology; location; and physiographic, hydrological, ecological, cultural, and natural resource features; a brief synopsis of the history of AOI-1; summary of existing data; and information on fate and transport and effects of chemicals. As such, the Respondents shall provide a strategy that includes both biased sampling and random sampling. The risk assessments require that the sampling be conducted to demonstrate that data is statistically representative of AOI-1. The Respondents shall also confirm that the detection limits for all laboratories that are used are in accordance within the goals stated in the EPA’s risk assessment guidance.

The FSP shall consider the use of all existing data and shall justify the need for additional data whenever existing data will meet the same objective. Existing data, if used for the RI/FS, shall meet the data quality and usability requirements based on the data quality objectives for AOI-1. The FSP shall be written so that a field sampling team unfamiliar with AOI-1 would be able to gather the samples and field information required. The Respondents shall refer to EPA’s guidance document entitled, “Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA” (EPA 1988b) which describes the suggested RI/FS FSP format and content. The Respondents shall document any required changes to the Final FSP, during the implementation of the RI/FS, in the aforementioned RI/FS Work Plan Refinement/Modification Notices.

b) The RI/FS Quality Assurance Project Plan (QAPP) shall describe the project objectives and organization, functional activities, and quality assurance and quality control (QA/QC) protocols that will be used to achieve the desired Data Quality Objectives (DQOs). The DQOs shall at a minimum reflect use of analytical methods for identifying contamination and remediating contamination consistent with the levels for remedial action objectives identified in the NCP. In addition, the RI/FS QAPP shall address sampling procedures; sample custody; analytical procedures; data reduction, validation, and reporting; and personnel qualifications. The Respondents shall refer to the EPA’s guidance documents entitled; “EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5 ” (EPA 2001, EPA/240/B-01/003, March 2001, or the latest revision), and “Guidance for Quality Assurance Project Plans, EPA QA/G-5 ” (EPA 2002, EPA/240/R-02/009, December 2002, or the latest revision) which describe the suggested RI/FS QAPP format and content.

Subject to the provisions in Section X of the AOC, the Respondents shall prepare and submit to the EPA a final RI/FS SAP within sixty (60) calendar days after completing discussion of EPA’s comments on the draft RI/FS SAP (and in no event later than ninety (90) calendar days after receipt of the EPA’s comments on the draft RI/FS SAP).

28. The Respondents shall demonstrate in advance, to the EPA’s satisfaction, that each analytical laboratory it may use is qualified to conduct the proposed Work. This includes use of methods and analytical protocols for the chemicals of concern in the media of interest within detection and quantification limits consistent with both QA/QC procedures and the DQOs approved in the RI/FS QAPP for the Site by the EPA. The laboratory must have, and follow, an approved QA program. If a laboratory not in the Contract Laboratory Program (CLP) is selected, methods consistent with CLP methods shall be

used where appropriate. Any methods not consistent with CLP methods shall be approved by the EPA prior to their use. Furthermore, if a laboratory not in the CLP program is selected, a laboratory QA program must be submitted to the EPA for review and approval. The EPA may require the Respondents to submit detailed information to demonstrate that the laboratory is qualified to conduct the Work, including information on personnel and qualifications, equipment, and material specifications.

Task 4: RI/FS Health and Safety Plan

29. The Respondents shall prepare and submit to the EPA an RI/FS Health and Safety Plan (HSP) within sixty (60) calendar days after the Scoping Phase Meeting or conference call. This RI/FS HSP shall be prepared in accordance with the Occupational Safety and Health Administration regulations and protocols and must be in place prior to any onsite activities. The EPA will review, but not approve, the RI/FS HSP to ensure that all necessary elements are included and that the plan provides for the protection of human health and the environment. The EPA may, at its discretion, disapprove the RI/FS HSP and provide comments concerning those aspects of the plan which pertain to the protection of the environment and the health of persons not employed by, or under contract to, the Respondents. In addition, EPA may require a revised RI/FS HSP to be submitted for review in the event that the RI/FS WP is changed or amended (e.g., such as in the performance of pilot studies which may result in the airborne emissions of hazardous substances from AOI-1). The Respondents shall refer to the EPA's guidance document entitled, "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988b) which describes the suggested RI/FS HSP format and content.

Task 5: Community Involvement Plan

30. The development and implementation of community relations activities, including community interviews and developing a community involvement plan, are the responsibilities of EPA. Respondents must assist, as required by EPA, by providing information regarding AOI-1's history, participating in public meetings upon notice from EPA, or by preparing fact sheets for distribution to the general public. EPA will provide Respondents with the opportunity to review and provide comments on a draft community involvement plan, including the stakeholder and community mailing lists, and fact sheets prior to distribution. The extent of Respondents' involvement in community relations activities is left to the discretion of EPA. Respondents' community relations responsibilities, if any, are specified in the community involvement plan. All community relations activities will be subject to oversight by EPA.

Task 6: Site Characterization

31. As part of the Remedial Investigation (RI), the Respondents shall perform the activities described in this Task, including the preparation of an RI Report (Task 9, Remedial Investigation Report). The overall objective of AOI-1's characterization will be to describe areas of AOI-1 that may pose a threat to human health or the environment. This will be accomplished by first determining AOI-1's physiography, geology, and hydrology. Surface and subsurface pathways of migration shall be defined by the Respondents. The Respondents shall identify the sources of contamination and define the nature, extent, and volume of the sources of contamination, including their physical and chemical constituents. The Respondents shall also investigate the extent of migration of this contamination as well as its volume and any changes in its physical or chemical characteristics, to provide for a comprehensive understanding of the nature and extent of contamination at AOI-1. Using this information, contaminant fate and transport will then be determined and projected.

32. The Respondents shall implement the Final RI/FS WP, and SAP during this phase of the RI/FS. Field data will be collected and analyzed to provide the information required to accomplish the objectives of the study. The Respondents shall notify the EPA at least fifteen (15) calendar days in advance of the field work regarding the planned dates for field activities, including, but not limited to, ecological field surveys, field layout of the sampling grid, installation of wells, initiating sampling (air, surface water, ground water, sediments, soils, and biota, if applicable), installation and calibration of equipment, aquifer tests, and initiation of analysis and other field investigation activities (including geophysical surveys and borehole geophysics). The Respondents shall not proceed with field activities without prior EPA approval. The Respondents shall demonstrate that the laboratory and type of laboratory analyses that will be utilized during AOI-1's characterization meets the specific QA/QC requirements and the DQOs established for the investigation of the Site as specified in the Final RI/FS SAP. Activities are often iterative, and to satisfy the objectives of the RI/FS it may be necessary for the Respondents to supplement the Work specified in the Final RI/FS WP.

33. The Respondents shall perform the following activities as part of Task 6 (AOI-1 Characterization):

a) Field Investigation - The field investigation shall include the gathering of data to define AOI-1's physical and biological characteristics, sources of contamination, and the nature and extent of contamination at or from AOI-1. These activities shall be performed by the Respondents in accordance with the Final RI/FS WP and SAP. At a minimum, this field investigation shall address the following:

i) Implementation and Documentation of Field Support Activities - The Respondents shall initiate field support activities following the Final RI/FS WP and SAP approved by the EPA. Field support activities may include obtaining access to AOI-1; scheduling; and procurement of equipment, office space, laboratory services, and/or contractors. The Respondents shall notify the EPA at least fifteen (15) calendar days prior to initiating field support activities so that the EPA may adequately schedule oversight activities. The Respondents shall also notify the EPA in writing upon completion of field support activities.

ii) Investigation and Definition of Site Physical and Biological Characteristics - The Respondents shall collect data on the physical and biological characteristics of AOI-1 and its surrounding areas including the physiography, geology, hydrology, and specific physical characteristics identified in the Final RI/FS WP. This information shall be ascertained through a combination of physical measurements, observations, and sampling efforts, and will be utilized to define potential transport pathways and human and ecological receptor populations (including risks to endangered or threatened species). In defining AOI-1's physical characteristics, the Respondents shall also obtain sufficient engineering data for the projection of contaminant fate and transport, and development and screening of remedial action alternatives, including information to assess treatment technologies.

iii) Definition of Sources of Contamination - The Respondents shall attempt to locate each source of contamination as agreed upon in the RI/FS Work Plan. The physical characteristics and chemical constituents and their concentrations will be determined for all known and discovered sources of contamination. The Respondents shall conduct sufficient sampling to define the boundaries of the contaminant sources to the level established in the Final RI/FS QAPP and DQOs. Defining the source of contamination shall include analyzing the potential for contaminant release (e.g., long-term leaching from soil), contaminant mobility and persistence, and characteristics important for evaluating remedial actions, including information to assess treatment technologies.

iv) Description of the Nature and Extent of Contamination - The Respondents shall gather information to describe the nature and extent of contamination, at or from AOI-1, as a final step during the field investigation. To describe the nature and extent of contamination, the Respondents shall utilize the information on AOI-1's physical and biological characteristics and sources of contamination to give a preliminary estimate of the contaminants that may have migrated. The Respondents shall then implement an iterative monitoring program and any study program identified in the Final RI/FS WP or SAP such that by using analytical techniques sufficient to detect and quantify the concentration of contaminants, the migration of contaminants through the various media at AOI-1 can be determined. In addition, the Respondents shall gather data for calculations of contaminant fate and transport. This process shall be continued until the area and depth of contamination are known to the level of contamination established in the Final RI/FS QAPP and DQOs. Respondents and EPA will use the information on the nature and extent of contamination to determine the level of risk presented by AOI-1 and to help determine appropriate remedial action alternatives to be evaluated.

b) Data Analyses - The Respondents shall analyze the data collected and develop or refine the Conceptual Site Model by presenting and analyzing data on source characteristics, the nature and extent of contamination, the transport pathways and fate of the contaminants present at AOI-1, and the effects on human health and the environment:

i) Evaluation of AOI-1 Characteristics: The Respondents shall analyze and evaluate the data to describe AOI-1's physical and biological characteristics, contaminant source characteristics (as necessary to identify principal threat or low threat wastes, and estimate waste volumes for risk assessment evaluation and remedial alternatives evaluation purposes), nature and extent of contamination, and contaminant fate and transport. Results of AOI-1's physical characteristics, source characteristics, and extent of contamination analyses are utilized in the analysis of contaminant fate and transport. The evaluation will include the estimated and/or actual releases from the sources, and horizontal and vertical spread of contamination as well as the mobility and persistence of the contaminants. Where modeling is appropriate, such models shall be identified by the Respondents to the EPA in a Technical Memorandum prior to their use. If EPA disapproves of or requires revisions to the technical memorandum, in whole or in part, subject to the provisions in Section X of the AOC, Respondents shall amend and submit to EPA a revised technical memorandum on modeling which is responsive to directions

and EPA's comments within sixty (60) calendar days after completing discussion of the EPA's comments on the draft technical memorandum (and in no event later than ninety (90) calendar days after receipt of the EPA's comments on the draft memorandum).

All data and programming, including any proprietary programs, shall be made available to the EPA together with a sensitivity analysis. The RI data shall be presented in a format to facilitate the Respondent's preparation of the Baseline Human Health and Ecological Risk Assessments (Task 7, Risk Assessments). All data shall be archived in a database in such a format that would be accessible to investigators as needed.

The Respondents shall agree to discuss, develop an appropriate scope, and then collect additional data for data gaps identified by the EPA that are needed to complete the risk assessments. Also, this evaluation shall provide any information relevant to AOI-1's characteristics necessary for evaluation of the need for remedial action in the risk assessments and for the development and evaluation of remedial alternatives. Analyses of data collected for AOI-1's characterization shall meet the DQOs developed in the Final RI/FS QAPP and stated in the Final RI/FS SAP (or revised during the RI).

c) Data Management Procedures – The Respondents shall consistently document the quality and validity of field and laboratory data compiled during the RI as follows:

i) Documentation of Field Activities - Information gathered during AOI-1's characterization shall be consistently documented and adequately recorded by the Respondents in well maintained field logs and laboratory reports. The method(s) of documentation shall be specified in the Final RI/FS WP and/or the SAP. Field logs shall be utilized to document observations, measurements, and significant events that have occurred during field activities. Laboratory reports shall document sample custody, analytical responsibility and results, adherence to prescribed protocols, nonconformity events, corrective measures, and data deficiencies.

ii) Sample Management and Tracking - The Respondents shall maintain field reports, sample shipment records, analytical results, and QA/QC reports to ensure that only validated analytical data are reported and utilized in the risk assessments and the development and evaluation of remedial alternatives. Analytical results developed under the Final RI/FS WP shall not be included in any characterization reports of AOI-1 unless accompanied by or cross-referenced to a corresponding QA/QC report. In addition, the Respondents shall establish a data security system to safeguard chain-of-custody forms and other project records to prevent loss, damage, or alteration of project documentation.

34. Reuse Assessment - If EPA, in its sole discretion, determines that a Reuse Assessment is necessary, Respondents will perform the Reuse Assessment in accordance with the SOW, RI/FS Work Plan and applicable guidance (EPA 2001c). The Reuse Assessment should provide sufficient information to develop realistic assumptions of the reasonably anticipated future land use for AOI-1.

Task 7: Risk Assessments

35. The Respondents shall perform a Baseline Human Health Risk Assessment, Screening Level Ecological Risk Assessment, and a Baseline Ecological Risk Assessment (if necessary) for the Site, which will be a part of the RI Report. The Respondents will prepare one section of the Final RI/FS WP (Task 2) which discusses the risk assessment process and outlines the steps necessary for coordinating with the EPA at key decision points within the process. Submittal of deliverables, meetings and/or conference calls, and presentations to the EPA will be reflected in the project schedule in the Final RI/FS WP to demonstrate the progress made on the risk assessments. The DQOs listed within the Final RI/FS QAPP will include DQOs specific to risk assessment needs, and critical samples needed for the risk assessments will be identified within the Final RI/FS SAP. The Respondents shall develop an initial Conceptual Site Model which may be revised as new information is obtained. These risk assessments shall consist of both Human Health and Ecological Risk Assessments as follows:

- a) Baseline Human Health Risk Assessment: The Respondents shall perform a Baseline Human Health Risk Assessment (BHHRA) to evaluate and assess the risk to human health posed by the contaminants present at AOI-1. The Respondents shall refer to the appropriate EPA guidance documents (EPA 1989b, 1991a, 1991b, 1991c, 1992a, and 2001b) in conducting the BHHRA. The Respondents shall address the following in the BHHRA:
 - i) Hazard Identification (sources) - The Respondents shall review available information on the hazardous substances present at AOI-1 and identify the major contaminants of concern.
 - ii) Dose-Response Assessment - The Respondents, with concurrence from the EPA, shall select contaminants of concern based on their intrinsic toxicological properties and distribution in the environment.
 - iii) Conceptual Exposure/Pathway Analysis - The Respondents shall identify and analyze critical exposure pathways (e.g., drinking water). The proximity of contaminants to exposure pathways and their potential to migrate into critical exposure pathways shall be assessed.
 - iv) Characterization of AOI-1 and Potential Receptors - The Respondents shall identify and characterize human populations in the exposure pathways.
 - v) Exposure Assessment - During the exposure assessment, the Respondents shall identify the magnitude of actual or potential human exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. The exposure assessment shall include an evaluation of the likelihood of such exposures occurring and shall provide the basis for the development of acceptable exposure levels. In developing the exposure assessment, the Respondents shall develop reasonable maximum estimates of exposure for both current land use conditions and potential future land use conditions at AOI-1.
 - vi) Risk Characterization - During risk characterization, the Respondents shall compare

chemical-specific toxicity information, combined with quantitative and qualitative information from the exposure assessment, to measured levels of contaminant exposure levels and the levels predicted through environmental fate and transport modeling. These comparisons shall determine whether concentrations of contaminants at or near AOI-1 are affecting or could potentially affect human health.

vii) Identification of Limitations/Uncertainties - The Respondents shall identify critical assumptions (e.g., background concentrations and conditions) and uncertainties in the BHHRA.

viii) Conceptual Site Model - Based on contaminant identification, exposure assessment, toxicity assessment, and risk characterization, the Respondents shall develop a Conceptual Site Model for AOI-1.

The Respondents shall prepare and submit to the EPA for review and approval, according to the schedule specified in the Final RI/FS Work Plan, a Draft BHHRA. Subject to the provisions in Section X of the AOC, the Respondents shall submit a revised BHHRA within sixty (60) calendar days after completing discussion of the EPA's comments on the Draft BHHRA (an in no event later than ninety(90) calendar days after receipt of the EPA's approval of the Draft BHHRA.

b) Baseline Ecological Risk Assessment: The Respondents shall perform the Baseline Ecological Risk Assessment (BERA) (if necessary) concurrently with the BHHRA. The BERA shall conform to current EPA guidance (EPA 1992a, EPA 1992b, EPA 1993, EPA 1997, and EPA 2001b). The scoping of all phases of the BERA shall follow the general approach provided in the EPA's guidance (EPA 1997) and shall include discussions between the Respondents and the EPA's risk assessors and risk managers. The BERA shall conform to the general outline provided in the EPA's guidance (EPA 1997).

The eight steps in the Baseline Ecological Risk Assessment (BERA) process include:

Step 1 - Screening-Level Problem Formulation and Ecological Effects Evaluation,

Step 2 - Screening-Level Preliminary Exposure Estimate and Risk Calculation,

Step 3 - Baseline Risk Assessment Problem Formulation,

Step 4 - Study Design and Data Quality Objectives,

Step 5 - Field Verification and Sampling Design,

Step 6 - Site Investigation and Analysis of Exposure and Effects,

Step 7 - Risk Characterization, and

Step 8 - Risk Management.

The Respondents shall interact closely with the EPA's Remedial Project Manager and risk assessment staff assigned to AOI-1 to ensure that draft deliverables are acceptable and major rework is avoided on subsequent submittals. The scope of the BERA will be determined via a phased approach as outlined in the EPA's guidance documents and documented in the following deliverables:

i) Step 1, Screening Level Problem Formulation and Ecological Effects Evaluation - The “Screening Level Problem Formulation and Ecological Effects Evaluation” step is part of the initial ecological risk screening assessment. For this initial step, it is likely that site-specific information for determining the nature and extent of contamination and for characterizing ecological receptors at AOI-1 is limited. This step includes all the functions of problem formulation (Steps 3 and 4) and ecological effects analysis, but on a screening level. The results of this step will be used in conjunction with exposure estimates during the preliminary risk calculation in Step 2 (Screening-Level Preliminary Exposure Estimate and Risk Calculation).

For the screening level problem formulation, the Respondents shall develop a Conceptual Site Model that addresses these five issues: 1) environmental setting and sources of COPCs known or suspected to exist at AOI-1, 2) contaminant fate and transport mechanisms that might exist at AOI-1, 3) if appropriate the mechanisms of ecotoxicity associated with contaminants and likely categories of receptors that could be affected, 4) the complete exposure pathways that might exist at AOI-1, and 5) selection of endpoints to screen for ecological risk.

The next step in the initial ecological risk screening assessment will be the preliminary ecological effects evaluation and the establishment of contaminant exposure levels that represent conservative thresholds for adverse ecological effects. Screening ecotoxicity values shall represent a no-observed-adverse-effect-level for long-term exposures to a contaminant. Ecological effects of most concern are those that can impact populations (or higher levels of biological organizations), and/or individual receptors for state and federally listed threatened/endangered or rare species; and include adverse effects on development, reproduction, and survivorship. For some of the data reported in the literature, conversions may be necessary to allow the data to be used for measures of exposure other than those reported. The Respondents shall consult with the EPA’s Remedial Project Manager and risk assessors concerning any extrapolations used in developing screening ecotoxicity values.

ii) Step 2, Screening-Level Exposure Estimate and Risk Calculation - The “Screening-Level Exposure Estimate and Risk Calculation” comprises the second step in the ecological risk screening assessment for AOI-1. Risk is estimated by comparing maximum documented exposure concentrations with the ecotoxicity screening values from Step 1. At the conclusion of Step 2, the Respondents shall decide, with concurrence from the EPA, that either the screening-level ecological risk assessment is adequate to determine that ecological threats are negligible, or available information is adequate to support a risk management decision, such as continuing to a more detailed ecological risk assessment (Steps 3 through 7). If the process continues, the screening-level assessment serves to identify exposure pathways and preliminary contaminants of concern for the BERA by eliminating those contaminants and exposure pathways that pose negligible risks.

To estimate exposures for the screening-level ecological risk calculation, AOI-1

contaminant levels and general information on the types of biological receptors that might be exposed should be known from Step 1. Complete exposure pathways will be evaluated and reasonable exposure values (as agreed to between EPA and Respondents) will be used for each environmental medium to estimate exposures. Potentially complete exposure pathways may require evaluation or may be evaluated using alternate methods. The need for additional evaluation of potentially complete pathways will be established based on discussions between EPA and Respondents.

The Respondents will estimate a quantitative screening-level risk using the exposure estimates developed according to Step 2 and the screening ecotoxicity values developed according to Step 1. For the screening-level risk calculation, the hazard quotient approach, which compares point estimates of screening ecotoxicity values and exposure values, is adequate to estimate risk.

At the end of Step 2, the Respondents shall decide, with concurrence from the EPA, whether the information available is adequate to support a risk management decision. The three possible decisions at this point will be: 1) There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk; 2) The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue to Step 3; or 3) The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted. The Respondents shall document the decision and the basis for it in a Draft Screening Level Ecological Risk Assessment (SLERA) Report and submit it to the EPA for review and approval according to the project schedule in the Final RI/FS WP. The Respondents shall submit a revised SLERA within sixty (60) days after completing discussion of the EPA's comments on the Draft SLERA Report (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft SLERA Report).

iii) Step 3, Baseline Risk Assessment Problem Formulation - The "Baseline Risk Assessment Problem Formulation" step of the BERA will refine the screening-level problem formulation and expands on the ecological issues that are of concern at AOI-1. In the screening-level assessment, conservative assumptions are used where site-specific information is lacking. In Step 3, the results of the screening assessment and additional site-specific information are used to determine the scope and goals of the BERA. Steps 3 through 7 will be required only if the screening-level assessment, in Steps 1 and 2, indicated a need for further ecological risk evaluation.

Problem formulation at Step 3 will include the following activities: a) refining preliminary contaminants of ecological concern; b) further characterizing ecological effects of contaminants; c) reviewing and refining information on contaminant fate and transport, complete exposure pathways, and ecosystems potentially at risk; d) selecting assessment endpoints; and e) developing a CSM with working hypotheses or questions that the Site investigation will address.

At the conclusion of Step 3, if needed, the Respondents shall submit a Draft BERA Problem Formulation (PF) Report to the EPA for review and approval according to the project schedule in the Final RI/FS Work Plan. The Respondents shall submit a revised BERA PF Report within sixty (60) days after completing discussion of the EPA's comments on the Draft BERA PF Report (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft BERA PF Report). This report shall discuss the assessment endpoints, exposure pathways, risk questions, and the CSM integrating these components. The products of Step 3 will be used to select measurement endpoints and to develop the BERA Work Plan (WP) and Sampling and Analysis (SAP) for AOI-1 in Step 4.

iv) Step 4, Study Design and Data Quality Objective Process - The "Study Design and Data Quality Objective Process" step of the BERA will establish the measurement endpoints which complete the CSM in Step 3. The CSM will then be used to develop the study design and DQOs. The deliverables of Step 4 will be the BERA WP and SAP, which describe the details of AOI-1's investigation as well as the data analysis methods and DQOs. The Draft BERA WP shall describe the assessment endpoints, exposure pathways, questions and testable hypotheses, measurement endpoints and their relation to assessment endpoints, and uncertainties and assumptions. The Draft BERA SAP shall describe data needs; scientifically valid and sufficient study design and data analysis procedures; study methodology and protocols, including sampling techniques; data reduction and interpretation techniques, including statistical analyses; and quality assurance procedures and quality control techniques. The Respondents shall submit to the EPA for review and approval a Draft BERA WP and SAP according to the schedule specified in the Final RI/FS Work Plan. The Respondents shall submit a Revised BERA WP and SAP within sixty (60) days after completing discussion of the EPA's comments on the Draft BERA WP and SAP (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft BERA WP and SAP).

v) Step 5, Field Verification of Sampling Design - The "Field Verification of Sampling Design" step of the BERA process will ensure that the DQOs for AOI-1 can be met. This step verifies that the selected assessment endpoints, testable hypotheses, exposure pathway model, measurement endpoints, and study design from Steps 3 and 4 are appropriate and implementable at the Site. Step 6 of the BERA process cannot begin until the Final BERA WP and SAP are approved by the EPA.

vi) Step 6, Site Investigation and Analysis Phase - The "Site Investigation and Analysis Phase" of the BERA process shall follow the Final BERA WP and SAP developed in Step 4 and verified in Step 5. The Step 6 results are then used to characterize ecological risks in Step 7.

The Final BERA WP for AOI-1 investigation will be based on the CSM and will specify the assessment endpoints, risk questions, and testable hypotheses. During AOI-1 investigation, the Respondents shall adhere to the DQOs and to any requirements for co-located sampling. The analysis phase of the BERA process will consist of the technical

evaluation of data on existing and potential exposures and ecological effects at AOI-1. This analysis will be based on the information collected during Steps 1 through 5 and will include additional assumptions or models to interpret the data in the context of the CSM. Changing field conditions and new information on the nature and extent of contamination may require a change to the Final BERA SAP.

vii) Step 7 - Risk Characterization - The "Risk Characterization" step is considered the final phase of the BERA process and will include two major components: risk estimation and risk description. Risk estimation will consist of integrating the exposure profiles with the exposure-effects information and summarizing the associated uncertainties. The risk description will provide information important for interpreting the risk results and will identify a threshold for adverse effects on the assessment endpoints. At the end of Step 7, the Respondents shall submit a Draft BERA Report to EPA for review and approval according to the project schedule in the Final RI/FS WP. The Respondents shall submit a revised BERA Report within sixty (60) days after completing discussion of the EPA's comments on the Draft BERA Report (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft BERA Report).

viii) Step 8 - Risk Management - "Risk Management" at the Site will be the responsibility of the EPA's Remedial Project Manager and risk assessor(s), who must balance risk reductions associated with cleanup of contaminants with potential impacts of the remedial actions themselves. In Step 7, a threshold for effects on the assessment endpoint as a range between contamination levels identified as posing no ecological risk and the lowest contamination levels identified as likely to produce adverse ecological effects will be identified. In Step 8, the EPA's Remedial Project Manager and risk assessor(s) will evaluate several factors in deciding whether or not to clean up to within that range. This risk management decision will be finalized by the EPA in the Record of Decision for the Site based on the nine criteria.

Task 8: Treatability Studies

36. Treatability testing, if necessary and if treatability testing is applicable for an identified alternative, shall be performed by the Respondents to assist in the detailed analysis of alternatives. In addition, if applicable, testing results and operating conditions shall be used in the detailed design of the selected remedial technology. The following activities shall be performed by the Respondents:

- a) Determination of Candidate Technologies and of the Need for Testing - The Respondents shall identify candidate technologies for a treatability studies program.

The listing of candidate technologies will cover the range of technologies required for alternatives analysis. The specific data requirements for the testing program will be determined and refined during the characterization of the Site and the development and screening of remedial alternatives. The Respondents shall perform the following activities:

- i) Conduct of Literature Survey and Determination of the Need for Treatability Testing - The Respondents shall conduct a literature survey to gather information on performance, relative costs, applicability, removal efficiencies, operation and maintenance

requirements, and implementability of candidate technologies. If practical technologies have not been sufficiently demonstrated, or cannot be adequately evaluated for this Site on the basis of available information, treatability testing may need to be conducted. Where it is determined by the EPA that treatability testing is required, and unless the Respondents can demonstrate to the EPA's satisfaction that they are not needed, the Respondents shall be required to submit a Treatability Study Work Plan to the EPA outlining the steps and data necessary to evaluate and initiate the treatability testing program.

ii) Evaluation of Treatability Studies - Once a decision has been made to perform treatability studies, the Respondents and the EPA will decide on the type of treatability testing to use (e.g., bench versus pilot, etc.). Because of the time required to design, fabricate, and install pilot scale equipment as well as perform testing for various operating conditions, the decision to perform pilot testing shall be made as early in the process as possible to minimize potential delays of the Feasibility Study (Task 10). If the EPA determines that treatability studies are necessary, the Respondents shall submit a Draft Treatability Study Work Plan (TSWP), Sampling and Analysis Plan (SAP), and Health and Safety Plan within sixty (60) calendar days after the determination that treatability studies are necessary. Subject to the provisions in Section X of the AOC, the Respondents shall submit a revised TSWP, SAP, and HSP within sixty (60) days after completing discussion of the EPA's comments on the Draft TSWP (and in no event later than ninety (90) calendar days after receipt of the EPA's comments on the Draft TSWP. The EPA will not approve the TS HSP but may provide comments to the Respondents.

The Respondents shall submit a Draft Treatability Study (TS) Report to the EPA for review and approval according to the project schedule in the Final Treatability Study Work Plan. Subject to the provisions in Section X of the AOC, the Respondents shall submit a revised TS Report within sixty (60) calendar days after completing discussion of the EPA's comments on the Draft TS Report (and in no event later than ninety (90) calendar days after receipt of the EPA's comments of the Draft TS Report. This report shall evaluate the technology's effectiveness and implementability in relation to the Preliminary Remediation Goals established for the Site. Actual results must be compared with predicted results to justify effectiveness and implementability discussions.

Task 9: Remedial Investigation Report

37. The Respondents shall prepare and submit a Remedial Investigation (RI) Report. The Respondents shall refer to the EPA's guidance document entitled, "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988b), including Table 3-13 (Suggested RI Report Format), for the suggested RI Report format and content. The Respondents shall discuss the RI Report format and content with the EPA's Remedial Project Manager early in the RI/FS process. The information shall include a summary of the results of the field activities to characterize AOI-1, classification of ground water beneath AOI-1, nature and extent of contamination for all media, and appropriate site-specific discussions for fate and transport of contaminants. The Respondents shall incorporate the results of Task 7 (Risk Assessments) into the RI Report, as appropriate.

The Respondents shall submit a Draft RI Report to the EPA for review and approval according to

the project schedule in the Final RI/FS Work Plan. Subject to the provisions in Section X of the AOC, the Respondents shall submit a revised RI Report within sixty (60) calendar days after completing discussion of the EPA's comments on the Draft RI Report (and in no event later than ninety (90) calendar days after receipt of the EPA's comments on the Draft RI Report).

Task 10: Feasibility Study

38. The Respondents shall perform a Feasibility Study (FS) as specified in this SOW. The FS shall include, but not be limited to, the development and screening of alternatives for remedial action, a detailed analysis of alternatives for remedial action, and submittal of Draft and Final FS Reports as follows:

a) Development and Screening of Alternatives for Remedial Action - The Respondents shall develop an appropriate range of remedial alternatives that will be evaluated through development and screening.

b) Detailed Analyses of Alternatives for Remedial Action - The Respondents shall conduct a detailed analysis of remedial alternatives (including no action) for the candidate remedies identified during the screening process described in this Task. This detailed analysis shall follow the EPA's guidance document entitled, "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988b) and other appropriate guidance documents. The major components of the Detailed Analysis of Alternatives for Remedial Action shall consist of an analysis of each option against a set of nine evaluation criteria taking sustainability into account and a separate discussion for the comparative analysis of all options with respect to each other in a manner consistent with the NCP. The Respondents shall not consider state and community acceptance during the Detailed Analysis of Alternatives. The EPA will perform the analysis of these two criteria. At the conclusion of the Detailed Analysis of Alternatives and within the time frame specified in the project schedule in the Final RI/FS WP, the Respondents shall provide the EPA with a Draft FS Report as outlined below.

Draft Feasibility Study Report - The Respondents shall submit to the EPA, for review and approval, a Draft FS Report which documents the activities conducted during the Development and Screening of Alternatives and the Detailed Analyses of Alternatives, as described above, according to the project schedule in the Final RI/FS WP. The Respondents shall refer to the EPA's guidance document entitled, "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA" (EPA 1988b), specifically Table 6-5 (Suggested FS Report Format) for suggested FS Report content and format.

c) Final Feasibility Study Report – The Draft FS Report shall provide the basis for the Proposed Plan developed by the EPA under CERCLA and shall document the development and analysis of remedial alternatives. The Draft FS Report may be subject to change following comments received during the public comment period on the EPA's Proposed Plan. The EPA will forward any comments pertinent to content of the Draft FS Report to the Respondents. Subject to the provisions in Section X of the AOC, the Respondents shall submit a revised FS Report within sixty (60) calendar days after completing discussion of the EPA's comments (and any public comments provided by EPA) on the Draft FS Report (and in no event later than ninety (90) calendar days after the receipt of comments from EPA on the Draft FS Report).

APPENDIX A
SCHEDULE OF DELIVERABLES/MEETINGS
STATEMENT OF WORK
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
U.S. OIL RECOVERY SUPERFUND SITE – AREA OF INVESTIGATION-1

DELIVERABLE	DUE DATE (CALENDAR DAYS)
1. Scoping Phase Meeting	Meeting or conference call to be scheduled within fourteen (14) days after the effective date of the AOC.
2. Draft and Final RI/FS Work Plan (WP)	Draft due within sixty (60) days after the Scoping Phase Meeting or conference call. Final due within sixty (60) days after completing discussion of the EPA's comments on the Draft RI/FS Work Plan (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft RI/FS Work Plan)
3. Draft and Final RI/FS Sampling and Analysis Plan (SAP)	Draft due within sixty (60) days after the Scoping Phase Meeting or conference call. Final due within sixty (60) days after completing discussion of the EPA's comments on the Draft RI/FS SAP (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft RI/FS Work SAP)
4. RI/FS Site Health and Safety Plan	Plan due within sixty (60) days after the Scoping Phase Meeting or conference call.
5. Draft and Final Technical Memorandum on Modeling of Site Characteristics	Draft due when Respondents propose that modeling is appropriate. Revised due within sixty (60) days after completing discussion of the EPA's comments on the draft memorandum (and in no event later than ninety (90) days after receipt of the EPA's comments on the draft memorandum).
6. Draft and Final Baseline Human Health Risk Assessment (BHHRA)	Draft due as specified in the Final RI/FS WP. Revision due within sixty (60) days after completing discussion of the EPA's comments on the Draft BHHRA (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft BHHRA).
7. Draft and Final Screening Level Ecological Risk Assessment (SLERA) Report	Draft due as specified in the Final RI/FS WP. Revision due within sixty (60) days after completing discussion of the EPA's comments on the Draft SLERA Report (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft SLERA Report).
8. Draft and Final Baseline Ecological Risk Assessment (BERA) Problem Formulation (PF) Report	Draft due as specified in the Final RI/FS WP. Revised due within sixty (60) days after completing discussion of the EPA's comments on the Draft BERA PF Report (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft BERA PF Report).

APPENDIX A (CONTD.)
SCHEDULE OF DELIVERABLES/MEETINGS
STATEMENT OF WORK
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
U.S. OIL RECOVERY SUPERFUND SITE

DELIVERABLES/MEETINGS	DUE DATES (CALENDAR DAYS)
9. Draft and Final Baseline Ecological Risk Assessment (BERA) Work Plan (WP) and Sampling and Analysis Plan (SAP)	Draft due as specified in the Final RI/FS WP. Revision due within sixty (60) days after completing discussion of the EPA's comments on the Draft BERA WP and SAP (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft BERA WP and SAP).
10. Draft and Final Baseline Ecological Risk Assessment (BERA) Report	Draft due as specified in the Final RI/FS WP. Revision due within sixty (60) days after completing discussion of the EPA's comments on the Draft BERA Report (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft BERA Report).
11. Draft and Final Treatability Study (TS) Work Plan (WP), Sampling and Analysis Plan (SAP), and Health and Safety Plan	Revision Draft due within ninety (90) calendar days after the determination that treatability studies are necessary for the identified alternative. Final due within sixty (60) days after completing discussion of the EPA's comments on the Draft TSWP (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft TSWP).
12. Draft and Final Treatability Study (TS) Report	Revision Draft due as specified in the Final RI/FS TSWP. Final due within sixty (60) days after completing discussion of the EPA's comments on the Draft TS Report (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft TS Report).
13. Draft and Final Remedial Investigation (RI) Report	Draft due as specified in the Final RI/FS WP. Revision due within sixty (60) days after completing discussion of the EPA's comments on the Draft RI Report (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft RI Report).
14. Draft and Final Feasibility Study (FS) Report	Draft due as specified in the Final RI/FS WP. Revision due within sixty (60) days after completing discussion of the EPA's comments on the Draft FS Report (and in no event later than ninety (90) days after receipt of the EPA's comments on the Draft FS Report).
15. Bi-Monthly Status Reports	Initially due as specified in the Final RI/FS Work Plan. Thereafter due by the fifteenth day of every other following month.

APPENDIX B
GUIDANCE DOCUMENTS
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
U.S. OIL RECOVERY SUPERFUND SITE – AREA OF INVESTIGATION- 1

The following list comprises some of the guidance documents that are applicable to the Remedial Investigation and Feasibility Study process. The Respondents should consult with EPA's Remedial Project Manager for additional guidance and to ensure that the following guidance documents have not been superseded by more recent guidance:

U.S. Environmental Protection Agency (EPA) 1987a. "Data Quality Objectives for Remedial Response Activities." Office of Emergency and Remedial Response and Office of Waste Programs Enforcement. EPA/540/G-87/003. OSWER Directive No. 9335.0-7b. March 1987.

EPA 1987b. "Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements." Office of Emergency and Remedial Response. OSWER Directive No. 9234.0-05. July 9, 1987.

EPA 1988a. "CERCLA Compliance with Other Laws Manual." Office of Emergency and Remedial Response. OSWER Directive No. 9234.1-01. August 1988.

EPA 1988b. "Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA." Office of Emergency and Remedial Response. EPA/540/G-89/004. OSWER Directive No. 9355.3-01. October 1988.

EPA 1989a. "CERCLA Compliance with Other Laws Manual: Part II. Clean Air Act and Other Environmental Statutes and State Requirements." Office of Emergency and Remedial Response. OSWER Directive No. 9234.1-02. August 1989.

EPA 1989b. "Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A)." Office of Emergency and Remedial Response. EPA/540/1-89/002. OSWER Directive No. 9285.7-01A. December 1989.

EPA 1991a. "Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors." Office of Emergency and Remedial Response. OSWER Directive No. 9235.6-03. March 1991.

EPA 1991b. "Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part B), Development of Risk-Based Preliminary Remediating Goals." Office of Emergency and Remedial Response. OSWER Directive No. 9285.7-01B. December 1991.

EPA 1991c. "Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part C), Risk Evaluation of Remedial Alternatives." Office of Emergency and Remedial Response. OSWER Directive No. 9285.7-01C. 1991.

EPA 1992a. "Guidance for Data Useability in Risk Assessment." Office of Emergency and Remedial Response. OSWER Directive No. 9285.7-09A. April 1992 (and Memorandum from Henry L. Longest dated June 2, 1992).

EPA 1992b. "Supplemental Guidance to RAGS: Calculating the Concentration Term." Office of Emergency and Remedial Response. OSWER Directive No. 9285.7-081. May 1992.

EPA 1997. "Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments." Office of Emergency and Remedial Response. EPA/540-R-97-006. June 5, 1997.

EPA 2000. "Guidance for the Data Quality Objectives Process." EPA QA/G-4, EPA/600/R-96/055. August 2000.

EPA 2001a. "EPA Requirements for Quality Assurance Project Plans." Office of Environmental Information. EPA QA/R-5. EPA/240/B-01/003. March 2001.

EPA 2001b. "Risk Assessment Guidance for Superfund, Volume 1 - Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments). Final. Publication 9285.7-47. December 2001.

EPA 2001c. "Reuse Assessments: A Tool to Implement The Superfund Land Use Directive." OSWER 9355.7-06P", June 2001 available at

EPA 2002. "EPA Guidance for Quality Assurance Project Plans." EPA QA/G-5. EPA/240/R-02/009. December 2002.

EPA 2009a. "U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response Principles for Greener Cleanups" August 2009 available at http://www.epa.gov/oswer/greenercleanups/pdfs/oswer_greencleanup_principles.pdf

EPA 2009b. "EPA Region 6 Clean and Green Policy" September 2009 available at <http://www.cluin.org/greenremediation/docs/R6GRPolicy.pdf>

APPENDIX C
APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
U.S. OIL RECOVERY SUPERFUND SITE – AREA OF INVESTIGATION-1

A preliminary list of probable Applicable or Relevant and Appropriate Requirements (ARARs) will be generated by the Respondents during the Remedial Investigation and Feasibility Study process. This list will be compiled according to established EPA guidance, research of existing regulations, and collection of site-specific information and data. Three types of ARARs will be identified:

- 1) Chemical-Specific ARARs: These ARARs are usually health- or risk-based numerical values or methodologies used to determine acceptable concentrations of chemicals that may be found in or discharged to the environment.
- 2) Location-Specific ARARs: These ARARs restrict actions or contaminant concentrations in certain environmentally sensitive areas. Examples of areas regulated under various Federal laws include floodplains, wetlands, and locations where endangered species or historically significant cultural resources are present.
- 3) Action-Specific ARARs: These ARARs are usually technology- or activity-based requirements or limitations on actions or conditions involving specific substances.

Chemical- and location-specific ARARs are identified early in the process, generally during the site investigation, while action-specific ARARs are usually identified during the Feasibility Study in the detailed analysis of alternatives.

APPENDIX D

Technical Scope of Work

Area of Investigation 1 - USOR Property

Remedial Investigation/Feasibility Study

US Oil Recovery Site

INTRODUCTION

This appendix to the Statement of Work (SOW) provides the preliminary technical Scope of Work for the Remedial Investigation/Feasibility Study (RI/FS) at Area of Investigation 1 (“AOI-1”, also referred to as the “USOR Property” or “the property”) at the US Oil Recovery Superfund site (the Site). The objective of the Scope of Work is to evaluate the nature and extent of contamination resulting from operations at the USOR Property, to obtain information necessary to fill data gaps in the Preliminary Conceptual Site Model (PCSM) for the USOR Property, and allow the development and evaluation of remedial action alternatives in the FS. The specific activities and procedures for implementing this RI/FS will be presented in subsequent work plans described in the SOW.

As described below, this scope of work is based upon the following analyses:

- (1) Development of PCSMs for AOI-1 (human health and ecological), highlighting those potential exposure pathways and receptors for which additional data are needed to evaluate the completeness of a potential pathway and/or the significance of those pathways that are initially characterized as complete in support of the risk assessment.
- (2) Design of an iterative RI characterization program and process that provides the needed data, including identification of media to be sampled, sample locations and associated analytical parameters.
- (3) Identification of the data needed to complete the evaluation of potentially complete or potentially significant pathways in the PCSMs, and facilitate evaluation of potential remedial action alternatives in the FS.

Consistent with EPA’s expectations as noted in Paragraph 2 of the SOW, an “iterative” approach to data collection will be used during the RI to maximize the overall investigative effectiveness and efficiency and assist in decision making. Also, consistent with the SOW and the Triad Approach, a streamlined data assessment and reporting process is proposed for the RI/FS. The iterative sampling program will start with the investigation of on-property (defined as the area inside the existing fence at the USOR Property) soil, groundwater, surface water and sediment and off-property (defined as the area outside of the existing fence at the USOR Property) soil and groundwater and proceed to off-property sediment, surface water, and other environmental media as appropriate. This iterative program will use the data collected in previous phase(s) of investigation to help focus constituents of potential concern (COPCs) and investigation areas for subsequent sampling efforts. It is believed that this approach will help minimize the likelihood of making erroneous decisions with data that are difficult to interpret, do not support the performance or acceptance criteria defined in the RI/FS Work Plan, or do not support the overall project goal of identifying potential risks associated with past AOI-1 activities.

PRELIMINARY CONCEPTUAL SITE MODELS

PCSMs are presented for human health and ecological pathways as Figures 1 and 2, respectively. PCSMs present the current understanding of the type and occurrence of potential contaminant sources and possible exposure pathways associated with AOI-1. Consistent with EPA RI/FS Guidance (EPA, 1988), the PCSMs were developed on the basis of existing AOI-1 conditions (i.e., land use, historical process knowledge, hydrogeology, source areas, COPCs, and existing data). The hypotheses presented in the PCSMs will be tested iteratively, refined, and modified as necessary as data are collected during the RI. The following subsections discuss AOI-1 conditions and available information that are important to understanding the overall PCSMs and remaining data needs.

Current Land Use

The USOR Property is located at 400 North Richey Street in Pasadena, Harris County, Texas, 77506 (Figure 3). The approximately 12.2 acre property was most recently used as a used oil processing and waste treatment facility by US Oil Recovery LP (USOR LP). USOR LP began operations on the property in approximately June 2003 and acquired the property in December 2003. Prior to 2004, multiple businesses operated on the property including chemical manufacturing companies (specializing in fertilizers and/or herbicides/pesticides), a cow hide exporter, leather tanner, and companies with unknown operations including storage of various hard goods. Attachment D-1 contains a more detailed listing of the operational history of the property.

The USOR Property was abandoned by its current owner and is now under the custody and control of a court-appointed receiver. An office building, security guard shack, and large warehouse (approximately 25,000 square feet in size) are present on the property. The warehouse includes a former laboratory, machine shop, parts warehouse, and a material processing area that included a filter press. Approximately 800 55-gallon drums (some in over-packs) and 212 poly totes (300-400 gallons) containing various industrial wastes are present within the warehouse. A tank farm with approximately 24 aboveground storage tanks (ASTs) containing industrial wastes located within secondary containment is located on the north end of the warehouse. A large, concrete-walled aeration basin (also called the bioreactor) is located west of the tank farm. A containment pond is located west of the warehouse and south of the aeration basin. Approximately 225 roll-off boxes fitted with precipitation covers are located on the USOR Property. An inactive rail spur enters the south-central part of the USOR Property from the south and extends north along the west side of the warehouse. A utility right-of-way with various pipelines is present within the southern part of the USOR Property and pipelines are also present outside of the USOR Property along the eastern and western sides.

Currently, the USOR Property is enclosed within a six-foot chain link security fence with locked gates, security cameras have been installed, and access is monitored by a security contractor. The USOR Property was developed for industrial purposes in approximately 1947 and land use has remained industrial since that time. Land use in the vicinity of the USOR Property includes the following:

- North: Undeveloped land that includes high-tension power lines, with Vince Bayou and a heavy industrial property located further north.
- East: Undeveloped land that includes high-tension power lines, with N. Richey Street, Vince Bayou, and a heavy industrial property located further east.
- South: An east-west oriented pipeline right-of-way is located along the southern boundary of the USOR Property with an east-west oriented railroad line, an additional east-west oriented pipeline right-of-way, and a heavy industrial property located further south.
- West: A north-south pipeline right-of-way with undeveloped land, a City of Pasadena stormwater detention basin, and a heavy industrial property located further west.

Vince Bayou is located to the north and east of the USOR Property, is joined by Little Vince Bayou to the east of the USOR Property, and flows to the north and intersects with the east flowing Houston Ship Channel (HSC) approximately 0.4 miles north of the USOR Property. The closest residential land use is located approximately 0.08 miles (400 feet) south-southwest of the southwest corner of the USOR Property. The nearest public park (Light Company Park) is located approximately 0.24 miles (1,300 feet) south of the southern property boundary. The nearest school (Pasadena High School) is located approximately 0.5 miles southeast of the southern USOR Property boundary. The PCSMs are based on the premise that the USOR Property land use will remain commercial/industrial in the future. Documentation of future use restrictions as an industrial/commercial property will be provided in the

RI/FS Work Plan.

Topography

According to the Pasadena, Texas topographic map (USGS, 1982), the maximum elevation of AOI-1 is approximately 20 feet above mean sea level (msl) near the Containment Pond. The topography of the natural land surface generally slopes to the east and northeast towards Vince Bayou where the elevation is approximately sea level.

Geology

Based on the Geologic Atlas of Texas – Houston Sheet (BEG, 1982), subsurface soils at the USOR Property are underlain by the Beaumont Formation, which is comprised mostly of clay, silt, and sand and includes mainly stream channel, point-bar, natural levee, backswamp, and to a lesser extent coastal marsh and mud-flat deposits. The Beaumont Formation beneath the USOR Property is dominantly clay and mud of low permeability, high water-holding capacity, high compressibility, high to very high shrink-swell potential, poor drainage, level to depressed relief, low shear strength, and high plasticity.

Hydrogeology

The Gulf Coast Aquifer is a major aquifer underlying AOI-1 that consists of the Evangeline, Chicot and Jasper aquifers, which are composed of discontinuous sand, silt, clay, and gravel beds (TWDB, Report 380, July 2011). The apparent direction of groundwater flow in these units is to the southeast toward the Gulf of Mexico. In addition to the primary aquifers, groundwater often occurs in sand units in the shallow subsurface within the Beaumont Formation. These water-bearing units are not typically used for irrigation or drinking water due to relatively low yields or poor quality.

Limited previous subsurface investigations at the USOR Property have encountered silty clay, clay, silt and sand to a depth of approximately 25 feet below ground surface (bgs). Groundwater was observed at approximately 10 to 12 feet bgs during previous investigations. The apparent direction of groundwater flow at the USOR Property is to the northeast toward Vince Bayou.

Potential Source Areas and Chemicals of Potential Concern (COPCs)

The following potential source areas are present at AOI-1:

- 1) Drums
- 2) Aeration Basin (Bioreactor)
- 3) Sumps
- 4) Totes
- 5) Containment Pond
- 6) Aboveground Storage Tanks
- 7) Roll-off Boxes/Frac Tanks
- 8) Impacted Soil (including the former buried waste pit to the west of the warehouse that was identified in historical documents)
- 9) Unknown Subsurface Sources (Pits, Sumps, etc.)
- 10) Pipelines

Removal actions to address potential source areas 1-7 listed above are being developed/implemented pursuant to the Administrative Settlement Agreement and Order on Consent for a Time-Critical Removal Action dated August 25, 2011 (“Removal Action AOC”). Due to the nature of the removal actions and

the associated field work, there is the potential for interference with the performance of the activities described in this Scope of Work. Consequently, the Work Plan shall include a schedule that coordinates the activities described in this Scope of Work so as to avoid any potential interference.

Attachment D-1 provides for AOI-1: 1) general information, 2) ownership and operational history, 3) a list of historical releases taken from existing documents, 4) investigation history, 5) a list of historical removal and response actions, 6) potential impacts at off-property areas, and the rationale for sample locations at AOI-1 that are provided below in this document. Removal actions conducted by the PRP Group will be documented in separate reports to EPA and TCEQ pursuant to the Removal Action AOC. It should be noted that remedial actions may be necessary pending the outcome of the RI but, at this time, those actions have not been identified.

A preliminary list of COPCs has been developed based on historical data for hazardous substances present at the USOR Property, waste materials previously handled or currently present at the USOR Property, and analytical laboratory results of samples of environmental media collected from the USOR Property and nearby off-property areas. Samples were collected by EPA and TCEQ (or their contractors) during release response actions prior to July 2010 or stabilization activities conducted by EPA. Prior to July 2010, samples were collected during release-related response actions including samples of liquids leaking from containment vessels, ponded liquids, and/or impacted soil. After July 2010, liquid, sludge and solid samples were collected from drums, the bioreactor, sumps, poly totes, above-ground storage tanks, the containment pond, and roll-off boxes. Samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and metals, and Total Petroleum Hydrocarbons (TPH). As summarized in the Hazard Ranking System (HRS) Documentation Record (EPA, 2011), VOCs, SVOCs, pesticides, metals, and TPH were detected in the samples and are attributed to the USOR Property. A review of past industrial operations at the USOR Property and the results of previous environmental investigations conducted at the USOR Property support the inclusion of VOCs, SVOCs, pesticides, herbicides, and metals on the initial list of COPCs for the RI. For example, metals (arsenic), pesticides and herbicides are included due to historic use of the property for the manufacture of arsenical pesticide products, and the blending and storage of pesticides and herbicides. The COPC list will be refined after each iteration of the RI/FS as USOR Property data are evaluated such that only those COPCs that originated at the USOR Property are moved forward, as described more fully below.

Possible Exposure Pathways

The human health and ecological PCSMs for the USOR Property (Figures 1 and 2) show the range of human health and ecological exposure pathways including the primary and secondary sources, the primary and secondary release mechanisms, the exposure media (i.e., soil, groundwater, surface water, sediment, air, etc.), and potential receptors. The processes or mechanisms by which receptors may reasonably come into contact with USOR Property-related COPCs are shown from left to right on the figure. Exposure pathways are dependent on current and future land use, which is expected to remain as an industrial land use. An exposure pathway is defined by four elements (U.S. EPA, 1989):

- A source material and mechanism of constituent release to the environment;
- An environmental migration or transport media (e.g., soil) for the released constituents;
- A point of contact with the media of interest; and
- An exposure route (e.g., ingestion) at the point of contact.

An exposure pathway is considered “complete” if all four elements are present.

Potentially complete human health exposure pathways are indicated with a “C” in the potential receptors column of Figure 1. Potentially complete pathways are assumed to be complete based on existing

information. Although a pathway may be preliminarily identified as potentially complete, additional data are often needed to confirm that the pathway is complete and evaluate the significance of the potentially complete pathway. The PCSM also identifies possibly complete pathways with a “P” in the potential receptors column of Figure 1. At this stage of the RI/FS, it is not known whether these media have been impacted by USOR Property-related activities. Information related to complete and potentially and possibly complete exposure pathways will be used to identify data gaps and help guide the data collection effort, ultimately ensuring that sufficient data are collected to facilitate quantitative evaluation of these pathways in the human health risk assessment. Pathways that are not viable are considered incomplete and are identified with an “I” in the potential receptors column on Figure 1, most often because the receptor will not contact the media specified.

Potentially complete ecological exposure pathways are indicated with a “C” in the potential receptors column of Figure 2. Potentially complete pathways are assumed to be complete based on existing information. Although a pathway may be preliminarily identified as potentially complete, additional data are often needed to confirm that the pathway is complete and evaluate the significance of the potentially complete pathway. The ecological PCSM also identifies potentially complete pathways for which potential exposures will be evaluated in an iterative manner with a “P” in the potential receptors column of Figure 2. At this stage of the RI/FS, it is not known whether these media have been impacted by USOR Property-related activities. Information related to complete and potentially complete exposure pathways will be used to identify data gaps and help guide the data collection effort, ultimately ensuring that sufficient data are collected to facilitate quantitative evaluation in the ecological risk assessment. Pathways that are not viable are considered incomplete and are identified with an “I” in the potential receptors column on Figure 2, most often because the receptor will not contact the media specified.

In the first iteration of data collection, data will be collected for the on-property media (i.e., soil, groundwater, surface water, and sediment) and off-property soil and groundwater using the initial list of COPCs. The results of the evaluation of the first iteration data will then be used to develop an investigative strategy for off-property sediment and surface water based on those compounds that were determined to have originated at the USOR Property. The specific mechanism/criteria for that determination will be developed in the RI/FS Work Plan. The second iteration of data collection will include sampling of surface water and sediment in drainage paths leading to Vince Bayou and from within Vince Bayou (and possibly Little Vince Bayou), with sample locations/collection details and analyte list developed based on data from the previous investigation iterations. Finally, based on the evaluation of all previously collected data, sampling of fish and/or shellfish in Vince Bayou (and possibly Little Vince Bayou) will be conducted during a third iteration, as necessary. It is envisioned that a streamlined data evaluation and reporting process will be used to move from iteration to iteration in the RI as efficiently as possible (see details in the RI/FS Data Collection Activities section below). After each data collection iteration during the RI, the PCSMs presented in Figures 1 and 2 will be updated and refined as necessary. The iterative approach to the investigation and the streamlined data evaluation and reporting process are described in greater detail in the following sections.

DATA NEEDS

Based on an evaluation of the exposure pathways identified in Figures 1 and 2, and an analysis of the information needed to assess the completeness of these pathways, the data needs listed in Table 1 were developed for the USOR Property. Table 1 illustrates the data needs development process by: (1) noting the PCSM exposure medium for exposure pathways that were not judged to be incomplete; (2) identifying the specific data needed to determine whether that pathway is potentially complete; (3) listing the existing data that were reviewed as part of RI/FS scoping; and (4) describing the RI activities, approaches, and data collection methods to be performed to fill the identified data need.

A list of general data needs is also included in Table 1 and includes supplemental information needed for the RI such as land use, quality of habitat, climate, subsurface migration pathways, etc.

FS data needs are not included in Table 1 at this time. As FS data needs are identified as the iterative RI/FS process proceeds, appropriate programs to fill these needs will be developed. The development and evaluation of remedial alternatives will be performed as specified in the RI/FS guidance. First, the risk assessment findings will be used to develop remedial action objectives. General response actions will be developed to address these objectives, and preliminary technologies/alternatives associated with those response actions will be screened. If at any time during this process a data need related to the FS is identified, a program to collect that data will be developed and implemented.

EXISTING DATA EVALUATION

As noted above, existing data were reviewed and used during development of the PCSMs and the data needs summary (Table 1).

Existing soil and groundwater data from the USOR Property were compiled into the tables listed below and attached to this Scope of Work. The soil data tables also contain any data from off-property areas that were investigated as a result of past releases from the USOR Property. Surface water and sediment data collected for EPA in 2011 (Weston Solutions, Inc., 2011) from Vince Bayou and Little Vince Bayou were also compiled since these data have been used by EPA to rank the Site using the HRS. All of the existing data are used for scoping purposes only and are not intended for use in risk assessment calculations or as the sole basis for evaluation of potential remedial alternatives in the FS. Sampling locations for the existing data shown in the tables are shown on Figures 4 and 5.

It should be noted that there are limited historic data for soil and groundwater at the USOR Property. Furthermore, much of the soil and groundwater data from historical documentation for the USOR Property are of limited value due to the fact that much of the data lack the required backup information such as sample location maps, quality assurance/quality control (QA/QC) data, and/or analytical method information. Also, the use of older data is limited due to changes in analytical methods, QA/QC procedures, etc. As such, some data from previous investigations at the USOR Property were not included in the summary tables for these and other reasons. Finally, laboratory qualifiers (flags) were not included for all data. Due to the range of different qualifiers used in the data packages, a consistent set of qualifiers was developed and used for the data summary tables.

The following data summary tables were compiled for AOI-1:

Table 2 - Metals Concentrations in Soil Samples

Table 3 – Volatile and Semi-Volatile Organic Compound Concentrations in Soil Samples

Table 4 – Pesticide Concentrations in Soil Samples

Table 5 – Metals and Pesticides Concentrations in Groundwater Samples

Table 6 – Metals Concentrations in Surface Water Samples – 2011 Data

Table 7 – Metals Concentrations in Sediment – 2011 Data

Table 8 – Volatile and Semi-Volatile Organic Compound Concentrations in Sediment – 2011 Data

DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) (Table 9) are developed as part of the systematic planning process to define the type and quality of the data sufficient to characterize the USOR Property, conduct human health and ecological risk assessments, and perform the evaluation of remedial alternatives. The DQOs, therefore, support the rationale for the USOR Property investigation strategy and approach detailed in the following section. The data quality details of the DQO process will also be documented in the Quality Assurance Project Plan (QAPP) that will be developed with the RI/FS Work Plan.

The DQOs have been developed in general accordance with the “Guidance on Systematic Planning Using the Data Quality Objectives Process, EPA QA/G-4” (EPA, 2006). When data are collected during the RI/FS, the EPA-recommended systematic planning tool is the DQO process. The DQO process is a seven-step planning approach to develop sampling designs for data collection activities that support decision-making. The seven steps of the DQO process described by EPA are:

1. State the problem.
2. Identify the goal of the study.
3. Identify information inputs.
4. Define the boundaries of the study.
5. Develop the analytic approach.
6. Specify performance or acceptance criteria.
7. Develop the plan for obtaining data.

Steps 1 through 4 of the process are included in Table 9 and are discussed below. Steps 5 through 7 will be developed in the RI/FS Work Plan and QAPP since these steps are focused on detailed sampling and analytical processes and are not appropriate for this document. Some of the more important issues related to the DQOs are described in the following paragraphs.

Step 1: State the Problem

Historical USOR Property information suggests that contamination exists in on-property soil in areas of former operations, and that COPCs may have migrated off-property during unauthorized releases, spills and overland runoff following storm events. Previous sampling efforts, historical aerial photographs, relevant USOR Property information and reports have been thoroughly reviewed to better understand where COPCs may be on-property, what COPCs are potentially present, and what fate and transport of these COPCs may have occurred.

Because of the gradual topographic slope at the USOR Property, if COPCs were transported from the property, they would most migrate from the USOR Property to the east or north, deposit onto the surface soils in these areas and either remain in those soils or be transported further down-slope. Vince Bayou surface water and sediment would be the potential endpoint of transport and migration of USOR Property-related COPCs. Due to the highly industrialized nature of the surrounding area and the numerous possible point and non-point sources of COPCs in Vince Bayou and Little Vince Bayou unrelated to the USOR Property, it is difficult to identify the USOR Property-related COPCs without a thorough and complete understanding of on-property source characteristics and the transport/migration pathways off-property.

Develop the PCSM for the Area of Investigation

The PCSMs introduced above (Figures 1 and 2) convey what is known about the sources, releases, release mechanisms, contaminant fate and transport, exposure pathways, potential receptors and risks. The PCSMs were developed based on the review of relevant USOR Property information and with input from the PRP Group and EPA. Data collected during the RI/FS will be used to verify and revise the models as necessary. These DQOs were developed using the PCSMs.

Establish the Planning Team

The planning team is composed of project management and technical staff from EPA, TCEQ, identified Federal and State Natural Resource Trustees (Trustees), the PRP Group, and Pastor, Behling & Wheeler, LLC (PBW). The Project Team and organization will be described in the RI/FS Work Plan. The project management section of the RI/FS Work Plan will describe the decision-level authority and communication. Project management team members have been designated as members of the project decision-making team and as technical expertise support. Lines of communication are established between field staff, project management, the PRP Group, EPA, and other agency stakeholders to convey data from the field to decision makers and to convey decisions back to the field staff.

Identify Available Resources, Constraints and Deadlines

During the systematic planning, several critical field activities were identified. The outcome of these critical field activities may impact the scope and extent of other USOR Property investigation tasks. The critical field activities are the on-property surface and subsurface soil sampling, on-property sediment and surface water sampling, installation of monitoring wells on-property, and groundwater sampling from these monitoring wells. Based on the data obtained from the on-property field work, additional field activities will be undertaken in subsequent iterations. These subsequent iterations are anticipated to include the installation of additional monitoring wells on-property or off-property, groundwater sampling of these monitoring wells, off-property surface and/or subsurface soil sampling, and collection of background soil samples. Data obtained from these additional on-property and/or off-property sampling efforts will be used to focus subsequent off-property sediment and surface water (near the USOR Property and background), and potential fish and/or biota sampling investigation iterations.

Other practical constraints such as access and physical location that will affect characterization activities will need to be addressed. The presence of pipelines, utility easements and other AOI-1 features will be evaluated and sampling locations may change from the locations identified in this Scope of Work if necessary. The overall deliverable for the investigative activities at the USOR Property will be the RI/FS Report. However, several data assessment meetings (working meetings) will be held with EPA, TCEQ and Trustees stakeholders to review the RI data as it is collected and prior to conducting the next iteration of sampling, and develop work plan refinements as needed.

The available resources include the project management, technical staff, and drilling, and environmental laboratory contractors. Scheduling constraints of these personnel are not anticipated at this time. USOR Property characterization will be conducted in accordance with the Scope of Work provided herein and described in greater detail in the RI/FS Work Plan.

Step 2. Identify the Goal of the Study

The over-arching goals for the project are to characterize nature and extent of contamination associated with past USOR Property-related activities, demonstrate whether a COPC originated from the USOR Property, estimate potential human health and ecological risks from USOR Property-related COPCs, and design an effective remedial action plan for USOR Property-related impacts.

The review of historical data for the USOR Property was used in conjunction with the PCSMs to develop the data needs table shown in Table 1. This table was used to tie the potentially complete exposure pathways to the media of concern so that relevant USOR Property data could be collected to support the goals of the study.

At this point in the DQO process, the principal study questions, actions and decision statements are developed in a detailed manner for each media to be investigated. The result of these and subsequent steps of the DQO development process are presented in Table 9.

RI/FS DATA COLLECTION ACTIVITIES

The PCSMs, the conceptual descriptions of RI/FS activities in Table 1, and the DQOs were used to develop the initial RI/FS data collection activities and sample locations described below. Historical information (e.g., maps, aerial photographs, reports and other documentation) regarding potential source areas, property reconnaissance, and to a lesser degree the limited existing data, were used to guide the placement of initial investigation locations. Attachment D-1 provides a more detailed discussion of the rationale for each sample location for on-property media as well as off-property soil sample locations. These samples were selected in order to optimize the likelihood of detecting potential impacts from the USOR Property. Relative to a grid-based sampling program, these judgmental samples will likely overestimate potential risk but this type of sampling will provide a higher degree of confidence in evaluating whether the COPC originated at the USOR Property. The RI/FS Work Plan and RI Report will include information related to the sampling scheme and the adequacy of spatial coverage to satisfy project goals. The number of samples and sample locations ultimately needed to satisfy overall RI/FS objectives will be determined by the USOR Property conditions and the data obtained during the iterative phases of the RI/FS. However, consistent with the overarching objective of this scope of work, sample numbers/locations are proposed herein for the initial investigation phase (i.e., on-property soil, groundwater, surface water and sediment sampling and off-property soil and groundwater) to fill the identified data needs.

As noted previously and as illustrated by the PCSMs, data needs summary table (Table 1), and DQOs, investigation activities will initially focus on on-property environmental media (i.e., on-property soil, on-property groundwater, on-property surface water and on-property sediment) and off-property soil and groundwater. An iterative approach is proposed as the logical and effective and time-efficient manner for which the RI should be performed. This is due to the nature of the USOR Property where the source areas are located topographically higher than some of the potential receptors and potential impacts are primarily related to the movement of COPCs from the USOR Property to the receptors via surface drainage. Furthermore, receptors in Vince Bayou and Little Vince Bayou also are potentially impacted from the other documented industrial activities within the Vince Bayou and Little Vince Bayou watershed. In this regard, the determination of the impacts from the USOR Property, versus those from other sources of contaminants to Vince Bayou and Little Vince Bayou, must be carefully executed through the iterative progression of investigation activities beginning on the USOR Property and adjacent properties and working to Vince Bayou and including a comprehensive background study for media of

potential concern. This method will allow for the allocation of the relative contributions of COPCs to Vince Bayou and Little Vince Bayou among the multiple potential sources.

A data assessment meeting will be held after completing the data collection for each iteration to review the data, prior to proceeding with the next iteration of sampling. The iterative data collection program is described more fully below:

ITERATION	DESCRIPTION
1	AOI-1 on-property media (soil, groundwater, and surface water/sediment in the low-lying areas on the southwestern portion of AOI-1) and off-property soil and groundwater will be sampled and analyzed for the initial list of COPCs (metals, VOCs, SVOCs, pesticides, herbicides, and TPH) per the RI/FS Work Plan Sampling and Analysis Plan (SAP) and QAPP. After data validation, the sample concentrations will be compared to the screening criteria for that medium to be developed in the RI/FS Work Plan to determine whether the compound originated at the USOR Property. Data assessment tools (summary tables, maps, GIS data visualization, etc.) will be used to assist in making this determination. A working “data assessment” meeting will be held with the EPA, TCEQ and Trustees stakeholders where the data are reviewed and decisions are made regarding: 1) COPCs that will be carried forward and COPCs that can be eliminated from subsequent iterations of the RI/FS; and 2) locations of off-property surface water and sediment samples for the second iteration of the RI/FS. A Work Plan Refinement Notice (WRN) with the agreed-upon recommendations for the next iteration of sampling will be prepared for EPA approval. Upon receiving EPA approval, the specific activities proposed in the WRN will be initiated.
2	AOI-1 off-property surface water and sediment will be sampled and analyzed for the COPCs that were carried forward from the first iteration of sampling. After data validation, a working “data assessment” meeting will be held with the EPA, TCEQ and Trustees stakeholders where the data comparisons are reviewed and decisions are made regarding 1) COPCs that will be carried forward and COPCs that can be eliminated from subsequent iterations of the RI/FS based on whether that COPC originated at the USOR Property; 2) methods and locations for collection of fish and shellfish samples (if necessary) from Vince Bayou (and Little Vince Bayou, if needed) for the third iteration of the RI/FS; 3) other sampling and analytical considerations, etc. A WRN with the agreed-upon recommendations for the next iteration of sampling will be prepared for EPA approval. Upon receiving EPA approval, the specific activities proposed in the WRN will be initiated.
3	Prior to sampling fish and shellfish, sediment and surface water will be evaluated to determine what COPCs should be included in the fish/shellfish sampling program per recommendations and procedures identified in TCEQ, 2002, which is largely based on EPA procedures for evaluating potential impacts from the fish ingestion pathway when establishing surface water quality standards. Fish and shellfish will be sampled and analyzed for the COPCs that were carried forward from the second iteration of sampling. After data validation, the sample concentrations will be compared to the screening criteria for that medium to be developed in the RI/FS Work Plan or subsequently. A working “data assessment” meeting will be held with the EPA, TCEQ and Trustees stakeholders where the data comparisons are reviewed and decisions are made regarding the need for subsequent sampling for any media.

Given that the number of samples, the locations of the samples, and analytes to be measured in the samples for the off-property sediment, surface water, and biota cannot be determined until after the on-property media and off-property soil and groundwater data are evaluated, locations for off-property sediment, surface water and biota sampling activities that are described in the following sections and presented on the attached maps are subject to change. Detailed descriptions of the RI data collection activities will initially be provided in the RI/FS Work Plan, the Field Sampling Plan (FSP) and the QAPP as specified in the SOW. These plans will include descriptions of data collection activities for all iterations of the RI/FS. In other words, even though a particular media will not be sampled in the first iteration of the RI/FS (e.g., off-property sediment), the proposed methods for collection of those particular media samples will be included in the RI/FS Work Plan. The specific locations, analytes, and other specific information required for data collection in iterations two and three will be provided in the WRNs.

A comprehensive soil, sediment, and surface water background study (and biota if necessary) will be conducted to provide information related to whether a COPC originated at the USOR Property. Detailed information related to this study will be provided in the RI/FS Work Plan after additional research of the surrounding area and discussion with EPA, TCEQ and Trustees stakeholders on appropriate background reference areas.

Additional information that becomes available before or during the RI/FS will be considered and the investigation plan updated, as appropriate (e.g., the addition of sampling locations at the location of a previously unknown release). Also, field observations made during the field investigation will be used to guide additional investigation efforts and/or sampling, as appropriate.

General Investigation Activities

As shown in the General Data Needs section of Table 1, general investigation activities will be conducted and are related to the 1) potential presence of threatened and endangered species in the USOR Property vicinity; 2) subsurface utilities present at the USOR Property and off-property areas; 3) erosion potential of soils; 4) climate; 5) zoning and land use; 6) location of the flood plain; 7) historic USOR Property ownership activities, deed records, restrictive covenants, or deed notices; and 8) presence of ecological habitat. In addition, a water well records search will be conducted to identify registered water wells located within ½-mile of the USOR Property. A walking survey of immediately adjacent properties will also be conducted to identify the potential presence of un-registered water wells.

Analytical Methods and Analytes

The historic USOR Property ownership, information about past releases and operations at the property, previous environmental sampling conducted to-date at the property, and waste sampling conducted during emergency response activities indicate that various metals, petroleum hydrocarbons, pesticides and herbicides, several VOCs and SVOCs have potentially impacted AOI-1. Based on the COPCs described above, samples for the first iteration of data collection will be analyzed using the methods listed in the following table:

COPC	ANALYTICAL METHOD	ANALYTES
VOCs	USEPA Method 8260B	Target Compound List (TCL)
SVOCs	USEPA Method 8270C	TCL
Metals	USEPA Methods 6010B/7471A	Toxic Analyte List (TAL) ¹

¹ Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

Pesticides	USEPA Method 8081	TCL
Herbicides	USEPA Method 8151A	Per SW 846 Method
TPH	TX 1005	Per TX 1005 Method

Based on the information provided in the Evaluation of Analytical Data Collected for PCBs and Dioxins, dated November 19, 2013, these two classes of contaminants are not included in the list of COPCs for USOR Operations. However, if additional sources of PCBs and dioxins are discovered then this decision will be revisited.

The COPCs for off-property sediment, surface water and biota will be developed based on the results from the previous iterations of the investigation and whether the COPC was shown to originate at the USOR Property. Sample collection techniques, analytical method details, and other analyses that will be conducted on selected samples (e.g., total organic carbon, total dissolved solids, bulk density, grain size, etc.) will be described in detail in the FSP and QAPP to be submitted with the RI/FS Work Plan.

AOI-1 On-Property and Off-Property Soil Investigation

The AOI-1 on-property soil investigation will be performed as described in the following paragraphs:

Soil Borings

Proposed soil boring locations are shown on Figure 6. The locations of soil borings are based on review of historic documents, historic aerial photographs, and AOI-1 reconnaissance observations. More specifically, the locations coincide with one or more of the following:

- 1) Locations of past industrial activities (e.g., railroad spur, loading/unloading pads, former tanks, pipelines, etc.)
- 2) Locations of current industrial activities (roll-off boxes, bioreactor, etc.)
- 3) Areas of stressed vegetation;
- 4) Areas of disturbed soil (as suggested by historical aerial photographs and reconnaissance observations);
- 5) Locations of historical releases including those described in the HRS documentation and as summarized in Attachment D-1 to this Scope of Work;
- 6) Previous soil boring location indicating potential contamination;
- 7) Historic areas of stockpiled material based on aerial photographs; and
- 8) Areas that appear to receive drainage from USOR Property source areas.

Some of the off-property soil sample locations correspond to historic potential source areas (e.g., the bioreactor release location to the north of the USOR Property), areas of disturbed soil, or areas of stockpiled material. These locations and rationale for soil sample location are discussed in greater detail in Attachment D-1. Preliminary locations shown on Figure 6 are subject to revision based on the data and information collected during the investigation.

All soil borings will be advanced to the top of the uppermost water-bearing unit (anticipated to be approximately 10-15 feet below ground surface) for characterization of surface and subsurface soil and the collection of soil samples. Discrete soil samples will be collected for laboratory analysis of the initial list of COPCs (VOCs, SVOCs, metals, pesticides, herbicides, and TPH). Samples will be collected from the following intervals:

- Surface (0.0-0.5 ft. bgs);

- Shallow (0.5-5.0 ft. bgs) - actual sample interval will be selected from the 0.5-5.0 bgs interval based upon field conditions including visual evidence of contamination, organic vapor meter (OVM) measurements, etc. or from 4.0-5.0 bgs if no evidence of contamination is observed.
- Subsurface (greater than 5.0 ft.) – actual sample interval will be selected from the greater than 5.0 ft interval based upon field conditions including visual evidence of contamination, OVM measurements, etc. or from the one-foot interval above the saturated zone if no evidence of contamination is observed.

The specific sample intervals will depend on the location and purpose of the particular sample. At locations based on the presence of a current or historic source area or evidence of industrial activity (shown in red on Figure 6), samples will be collected from all three sample intervals listed above. At sample locations along drainage pathways (shown in blue on Figure 6), samples will be collected from the upper two intervals (surface soil, shallow soil).

Selected representative soil samples will be analyzed for potential fate and transport parameters (total organic carbon, bulk density, etc.). A detailed description of the program for soil sample analysis will be presented in the RI/FS Work Plan, the FSP, and the QAPP.

Given the characteristics of AOI-1 (i.e., unconsolidated sediments, shallow depth to groundwater, etc.), it is anticipated that soil sampling will be conducted using direct-push technology (DPT) (i.e., geoprobe).

During the soil investigation, an evaluation of AOI-1 characteristics (e.g., presence and quality of vegetative cover, soil type, etc.) will be performed to qualitatively evaluate the potential for erosion of soils.

The soil boring and the Groundwater High Resolution Site Characterization (HRSC) (EPA, 2003) program (see below) will be conducted prior to the investigations of the other on-property and off-property media. Data and observations from the soil sampling program may be used to revise the subsequent media investigations described in the following section. For example, if field observations during soil sampling activities indicate the presence of non-aqueous phase liquids (NAPL) at AOI-1, the locations and/or quantity of monitoring wells and/or the methods for well construction may be altered. Additional discussion of this issue and detailed procedures for the on-property and off-property sampling program will be presented in the RI/FS Work Plan, the FSP, and the QAPP.

AOI-1 On-Property and Off-Property Groundwater Investigation

As shown on Table 1, the AOI-1 on-property and off-property groundwater investigation will be performed as described in the following paragraphs.

High-Resolution Site Characterization

Concepts of the HRSC will be incorporated into the on-property groundwater investigation, as appropriate based on AOI-1 conditions. Initially, a series of vertical subsurface profiles using cone penetrometer testing (CPT) and/or the rapid optical screening tool (ROST) will be conducted perpendicular to the direction of groundwater flow (presumed to be to the northeast toward Vince Bayou, based on previous investigations at AOI-1) (Figure 6). These profiles will allow for the collection of a large amount of subsurface data in a short period of time. The CPT/ROST locations will be advanced to the base of the uppermost water bearing unit. Although limited information is available on the subsurface stratigraphy, it is likely that the uppermost groundwater bearing unit is no deeper than 30 feet bgs. The maximum depth of the CPT/ROST investigations will be 50 feet. At most of the transect locations, only the CPT tool will be advanced to provide stratigraphic information (i.e., soil type – sand, silt, or clay). At locations in the

central part of the USOR Property around the warehouse, the CPT and ROST tool will be advanced. The ROST tool provides information on soil type and the potential presence of NAPL in soils. If evidence of significant contamination is observed at any location (e.g., the presence of NAPL), advancement of the CPT/ROST tool will be halted. If evidence of significant contamination is not observed, the CPT/ROST boring will continue until the base of the uppermost groundwater bearing unit.

The CPT/ROST borings will be ground-truthed using DPT soil borings. After review of the CPT/ROST data, DPT borings will be conducted at a subset of the CPT/ROST boring locations. For the DPT borings, soil will be collected for visual inspection for the entire length of the boring. Furthermore, the CPT/ROST borings will be completed prior to the on-property soil investigation described above. Information from the CPT/ROST borings may be used to revise the locations, sampling intervals, etc. for the on-property soil borings. Use of CPT/ROST is not currently proposed for the off-property groundwater investigation but could be added based on the CPT/ROST results from the on-property groundwater investigation.

Additional HRSC techniques will be evaluated as the investigation proceeds. For instance, the collection of depth-discrete groundwater samples using multi-level sampling tools may be proposed if distinct multiple groundwater bearing units are observed, or if the groundwater-bearing units are of significant thickness.

Information from the HRSC techniques, in conjunction with information from the monitoring wells (stratigraphy, water levels, etc.) will allow for assessment of the potential hydrogeologic connection between USOR Property groundwater and Vince Bayou.

Detailed procedures for the groundwater HRSC program will be provided in the RI/FS Work Plan, FSP, and QAPP.

Monitoring Well Installation and Groundwater Sampling

The on-property soil sampling and groundwater HRSC programs will be used to determine the locations for permanent groundwater monitoring wells to be installed in the uppermost groundwater bearing unit at AOI-1 (Figure 6). If possible, soil borings will be converted to permanent monitoring wells at the locations where soil boring and monitoring well locations are co-located (Figure 6).

After development, samples will be collected from the monitoring wells and analyzed for the initial list of COPCs. Samples from selected monitoring wells will be analyzed for general or natural attenuation parameters such as cations/anions, total dissolved solids (TDS), etc. Groundwater field parameters (temperature, specific conductance, pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), etc.) will be measured during sample collection at all monitoring wells. Samples will be collected for total and dissolved concentrations of selected metals.

Groundwater sampling events will be conducted to assess seasonal variability (e.g., sample quarterly for a year, evaluate results, and then determine appropriate monitoring program frequency).

All wells will be surveyed by a professional land surveyor to determine spatial (X-Y) coordinates and the elevation above mean sea level of the top of the monitoring well casing (Z).

At a minimum, a water-level measurement will be recorded from each well prior to it being sampled. Separate water-level measurement events not associated with groundwater sampling may also be conducted. If NAPL is encountered, an in-well NAPL thickness measurement will be performed.

The results of the on-property groundwater investigation will be used to 1) determine the need for the investigation of deeper groundwater at AOI-1; and 2) guide off-property groundwater investigation activities. If necessary, these investigations will be conducted during the off-property soil investigation (i.e., the second iteration of investigation).

Detailed procedures for groundwater monitoring well installation and sampling will be provided in the RI/FS Work Plan, FSP, and QAPP.

Hydraulic Testing

Hydraulic testing (slug testing) will be conducted in selected wells to estimate the hydraulic conductivity of the groundwater bearing unit(s). These data will be used to establish groundwater classification (in conjunction with TDS concentrations), estimate groundwater flow velocities, contaminant transport, etc. Detailed procedures for hydraulic testing will be provided in the RI/FS Work Plan, FSP, and QAPP.

AOI-1 On-Property Sediment Investigation

Samples of sediment will be collected from the two areas at the southwest portion of the USOR Property as noted on Figure 6. The samples will be analyzed for COPCs and other parameters such as TOC, grain size, etc. Sample collection methods will be described in the RI/FS Work Plan, FSP and QAPP.

AOI-1 On-Property Surface Water Investigation

Samples of surface water will be collected from the two areas at the southwest portion of AOI-1 as noted on Figure 6 (if present). The samples will be analyzed for COPCs. For the metals, analysis will be conducted for total and/or dissolved concentrations depending on the specific COPC (and as designated by the ecological benchmark table). Collection of samples from these areas depends on conditions during the investigation since these areas likely do not always contain standing water. Sample collection methods will be described in the RI/FS Work Plan.

AOI-1 Off-Property Surface Water and Sediment Investigation

A program for the evaluation of COPCs from USOR Property-related activities in Vince Bayou (and possibly Little Vince Bayou) surface water and sediment will be developed in a WRN. As shown on Table 1, information on the watershed flow paths, surface water/sediment hydrodynamics, and other potential sources of COPCs to Vince Bayou and Little Vince Bayou will be reviewed during the development of this program. Surface water and sediment samples in Vince Bayou and Little Vince Bayou will be collected, as required, for analysis of COPCs retained from earlier iterations of the RI/FS.

USOR Property Fish/Shellfish Investigation

Sampling of fish, shellfish or other biota in Vince Bayou (and Little Vince Bayou) may be conducted if the results of previous RI/FS data collection iterations show that USOR Property-related COPCs are present in surface water and/or sediment at concentrations above screening levels or if bio-accumulative COPCs are present above applicable thresholds. A WRN will be developed that describes the appropriate species for sampling, the methods for sampling, the COPCs to be analyzed, etc.

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TABLES

TABLE 1
DATA NEEDS SUMMARY
USOR SUPERFUND SITE – USOR PROPERTY – AREA OF INVESTIGATION 1

PRELIMINARY CONCEPTUAL PROPERTY MODEL POTENTIAL EXPOSURE MEDIUM ⁽¹⁾	ITERATIVE DATA NEED	APPROACH TO FILL DATA NEED		
		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
On-Property Groundwater	1) AOI-1-specific hydrogeology (hydraulic gradient, hydraulic conductivity, hydrostratigraphy, lithology, etc.). 2) Nature and extent of COPC concentrations. 3) General groundwater chemistry at AOI-1 (salinity, cations/anions, groundwater classification, etc.). 4) Uses of groundwater at and in the vicinity of AOI-1. 5) Discharge of groundwater to surface water. 6) Potential for groundwater to contribute to vapor intrusion and ambient air. 7) Potential presence of other groundwater plumes in the area.	1) Existing hydrogeology data for AOI-1. 2) Area water well survey and use survey. 3) Historic groundwater concentration data. 4) Surrounding property groundwater quality data.	1) Evaluate AOI-1 hydrogeology. 2) Evaluate concentrations of COPCs in uppermost groundwater-bearing unit. 3) Perform more detailed water well and water use survey of area. 4) Perform a water well records search within ½-mile of AOI-1. Confirm that nearby properties are provided potable water from the local municipality. 5) Perform subsurface utility survey to identify obstructions for drilling program and preferential pathways for migration of COPCs. 6) Identify ongoing and/or historic spills/releases that have or have the potential to impact groundwater. 7) Evaluate potential for discharge of	1) Perform initial high-resolution property characterization (HRSC) using a combination of assessment methods (e.g., cone penetrometer testing, depth-discrete groundwater sampling of the uppermost groundwater unit, and traditional soil borings). 2) Install permanent groundwater monitoring wells at pre-selected locations based on results of review of initial property characterization results. Based on the results, refine the AOI-1 COPC list. 3) Measure general groundwater parameters (temperature, specific conductance, pH, dissolved oxygen (DO), oxidation-reduction potential (ORP), TDS, etc.). 4) Collect groundwater samples to characterize on-property groundwater and evaluate potential impacts from source areas. Assess the potential for off-property migration and vertical migration on-property, if needed. 5) Conduct groundwater sampling events to assess seasonal variability e.g., quarterly for a year, evaluate, then determine appropriate monitoring program). 6) Perform hydraulic testing (slug testing) in selected wells. This data will be used with TDS data to establish groundwater classification. 7) Evaluate total versus dissolved concentrations of metals in groundwater samples. 8) Perform a water well records search to identify registered water wells located within ½-mile of AOI-1. In addition, perform a walking survey of immediately adjacent properties to identify the potential presence of un-registered water wells. 9) Assess the hydrogeologic connection and the

TABLE 1
DATA NEEDS SUMMARY
USOR SUPERFUND SITE – USOR PROPERTY – AREA OF INVESTIGATION 1

PRELIMINARY CONCEPTUAL PROPERTY MODEL POTENTIAL EXPOSURE MEDIUM ⁽¹⁾	ITERATIVE DATA NEED	APPROACH TO FILL DATA NEED		
		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
			groundwater to surface water. 8) Evaluate groundwater data to assess possibility of vapor intrusion (model).	potential for discharge of groundwater to Vince Bayou through the evaluation of water levels and the development of hydrogeologic cross-sections.
On- and Off ⁽²⁾ - Property Soil	1) Nature and extent of COPC concentrations in soil. 2) Potential source areas (e.g., bioreactors, tank farm, roll off boxes, former buried waste pit, etc.). 3) Surface water drainage patterns. 4) General soil characteristics to evaluate impact on COPC mobilization and sequestration in soil.	1) Concentrations of COPCs in soil collected during various investigations at AOI-1, and correlation of existing soil data with potential sources (including historical sources).	1) Evaluate lateral and vertical extent of COPCs in samples of surface soil (0 to 0.5 ft bgs), shallow soils (0.5 to 5 ft bgs) and subsurface soil (greater than 5 ft bgs). 2) Collect general soil chemistry data (pH, TOC, grain size, etc.). 3) Evaluate topography and preferential surface water drainage pathways. 4) Identify ongoing and/or historic spills releases that have or have the potential to impact soil.	1) Use detailed topographic survey of AOI-1 and adjacent and contiguous off-property areas (to Vince Bayou) to identify drainage areas. 2) Advance soil borings to top of uppermost water-bearing unit to characterize surface and subsurface soil. 3) Collect discrete soil samples for laboratory analysis of COPCs. 4) Analyze selected representative samples for potential fate and transport parameters (total organic carbon, bulk density, etc.). 5) Evaluate property characteristics (e.g., presence and quality of vegetative cover, soil type, etc.) to qualitatively evaluate potential for erosion of soil. 6) Refine COPC list based on existing and newly-acquired data set.

TABLE 1
DATA NEEDS SUMMARY
USOR SUPERFUND SITE – USOR PROPERTY – AREA OF INVESTIGATION 1

PRELIMINARY CONCEPTUAL PROPERTY MODEL POTENTIAL EXPOSURE MEDIUM ⁽¹⁾	ITERATIVE DATA NEED	APPROACH TO FILL DATA NEED		
		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
On-Property Sediment (southeast areas of AOI-1 where surface water is present for the majority of the year)	1)Concentrations of COPCs in on-property sediment samples. 2)Nature of on-property sediment, i.e., is it beneath ponded rainwater or from other sources, is it ephemeral, etc.? 3)Adequacy of the habitat in the areas where sediment is present.	1)Source data (concentrations of COPCs, source type, etc.) 2)Historical information on releases from AOI-1. 3)Surface runoff patterns at AOI-1 to areas of standing water. 4)Concentrations of COPCs in on- property soil (no on- property sediment data are available).	1)Identify ongoing and/or historic spills/releases that have or have the potential to impact on-property sediment. 2)Collect sediment samples from areas of standing water on-property.	1)As appropriate based on the nature of the sediment at AOI-1, collect sediment samples for analysis of AOI-1 COPCs, organic carbon, grain size, etc.
On-Property Surface Water (southeast areas of AOI-1 where surface water is present for the majority of the year)	1)Concentrations of COPCs in on-property surface water samples. 2)Nature of the on-property surface water; i.e., is it ponded rainwater or from other sources, is it ephemeral, etc.?	1)Source data (concentrations of COPCs, source type, etc.) 2)Historical information on releases from AOI-1. 3)Surface runoff patterns at AOI-1 to areas of standing water. 4)Nature and extent of COPCs in on- property soil.	1)Identify ongoing and/or historic spills/releases that have or have the potential to impact on-property surface water. 2)Collect data necessary to characterize surface water flow regime and origin of standing water.	1)Perform detailed topographic survey to indicate where standing water will collect on-property. 2)As appropriate based on the nature of the surface water, collect surface water samples from standing water for analysis of COPCs. For metals, analysis will be conducted for total and/or dissolved concentrations depending on the COPC (and as designated by eco benchmark table).

TABLE 1
DATA NEEDS SUMMARY
USOR SUPERFUND SITE – USOR PROPERTY – AREA OF INVESTIGATION 1

PRELIMINARY CONCEPTUAL PROPERTY MODEL POTENTIAL EXPOSURE MEDIUM ⁽¹⁾	ITERATIVE DATA NEED	APPROACH TO FILL DATA NEED		
		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
On-Property Air	1)COPC concentrations in on-property air (derived from COPCs concentrations in on-property soil).	1) Concentrations of COPCs in on-property soil collected during various investigations at AOI-1. 2) Review of existing ambient air monitoring data for area, if available.	1)Use on-property soil COPC concentration data to estimate and/or model potential emissions of volatile organic compounds and fugitive dust in on-property air.	1)Evaluate AOI-1 characteristics (e.g., presence and quality of vegetative cover, soil type, etc.). 2)Evaluate local meteorological data. 3)Estimate and/or model potential COPC concentrations in on-property air using on-property soil and groundwater COPC concentrations data and qualitative data described above.
Off-Property Air	1)COPC concentrations in off-property air (derived from COPCs concentrations in off-property soil)	1) Concentrations of COPCs in off-property soil collected during various investigations at the Property. 2) Review of existing ambient air monitoring data for property area, if available.	1)Use off-property soil COPC concentration data to estimate and/or model potential emissions of volatile organic compounds and fugitive dust in off-property air.	1)Evaluate off-property characteristics (e.g., presence and quality of vegetative cover, soil type, etc.). 2)Evaluate local meteorological data. 3)Estimate and/or model potential COPC concentrations in off-property air using off-property soil COPC concentrations data and qualitative data described above.

TABLE 1
DATA NEEDS SUMMARY
USOR SUPERFUND SITE – USOR PROPERTY – AREA OF INVESTIGATION 1

PRELIMINARY CONCEPTUAL PROPERTY MODEL POTENTIAL EXPOSURE MEDIUM ⁽¹⁾	ITERATIVE DATA NEED	APPROACH TO FILL DATA NEED		
		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
Off-Property Surface Water ⁽²⁾	1) Presence of surface water and associated uses. 2) Watershed sub-basin. 3) Commercial, industrial, and municipal activities located along Vince Bayou and Little Vince Bayou (up-stream of AOI-1), including the identification of permitted outfalls. 4) Documented “spills/releases” within the watershed sub-basin that had and/or continue to have the potential to impact surface water at AOI-1. 5) Surface water flow characteristics. 6) Background concentrations of COPCs in Vince Bayou and Little Vince Bayou surface water. 7) Concentrations of COPCs in surface water samples attributable to AOI-1 sources.	1) Source data (concentrations of COPCs, source type, etc.). 2) Historical information on releases from AOI-1 to soil and surface water. 3) Surface water drainage patterns at AOI-1 to off-property areas, extending to Vince Bayou and Little Vince Bayou. 4) Nature and extent of COPCs in on-property and off-property soil. 5) COPC concentration data from samples of surface water. 6) Surface water advisories and associated data.	1) Delineate the boundary and drainage within the watershed sub-basin. 2) Identify potential land use practices that might have impacted surface water adjacent to AOI-1. 3) Identify on-going and/or historic spills/releases that have or have the potential to impact surface water. 4) Collect data to characterize surface water flow regime (e.g., flow velocity, groundwater to surface water interactions, etc.). 5) Evaluate the surface water quality and the potential presence of COPCs in surface water.	1) Obtain information from the USGS and other local sources to define the extent and flow paths within the watershed sub-basin. 2) Perform an area reconnaissance to identify properties located within the watershed sub-basin that have the potential to impact the surface water system. After facility identification, obtain regulatory information from public sources to confirm facility operations. 3) Perform a regulatory database search to identify spills and/or releases that have occurred within the watershed that reached or had the potential to reach Vince Bayou or Little Vince Bayou. 4) Obtain publically available information on the physical flow properties of Vince Bayou and Little Vince Bayou (e.g., under normal and storm events). 5) Collect surface water samples in Vince Bayou and Little Vince Bayou for analysis of water quality parameters and COPCs. As part of this assessment, address total versus dissolved COPC concentrations, designed to address ecological benchmark criteria. 6) Evaluate Vince Bayou and Little Vince Bayou surface water sample COPC data relative to background COPC data for surface water samples collected in Little Vince Bayou as well as upstream in Vince Bayou.

TABLE 1
DATA NEEDS SUMMARY
USOR SUPERFUND SITE – USOR PROPERTY – AREA OF INVESTIGATION 1

PRELIMINARY CONCEPTUAL PROPERTY MODEL POTENTIAL EXPOSURE MEDIUM ⁽¹⁾	ITERATIVE DATA NEED	APPROACH TO FILL DATA NEED		
		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
Off-Property Sediment ⁽²⁾	<ol style="list-style-type: none"> 1) Sediment and surface water hydrodynamics in Vince and Little Vince Bayou. 2) Background concentrations of COPCs in Vince Bayou and Little Vince Bayou sediment. 3) Concentrations of COPCs in sediment samples attributable to potential AOI-1 sources. 	<ol style="list-style-type: none"> 1) Source data (concentrations of COPCs, source type, etc.). 2) Historical information on releases from AOI-1. 3) Surface water drainage patterns from property extending to Vince Bayou and Little Vince Bayou. 4) Nature and extent of COPCs in on-property and off-property soil. 5) COPC concentration data from historic sediment samples. 	<ol style="list-style-type: none"> 1) Identify ongoing and/or historic spills/releases that have or have the potential to impact off-property sediment. 2) Collect data necessary to characterize sediment regime (sediment thickness, depositional patterns, TOC, grain size, etc.). 3) If necessary based on iterative approach to characterization, collect samples of sediment for analysis of AOI-1 COPCs. 	<ol style="list-style-type: none"> 1) Refine AOI-1 COPC list by evaluating source area, soil and groundwater sample data. 2) Collect sediment samples in Vince Bayou and Little Vince Bayou for analysis of AOI-1 COPCs, if warranted. 3) Evaluate potential for AOI-1 to contribute COPCs to sediment in Vince Bayou above background levels collected in Little Vince Bayou and upstream in Vince Bayou. 4) Evaluate general chemistry of sediment (pH, TOC, grain size, organic carbon, etc.) in all samples.

TABLE 1
DATA NEEDS SUMMARY
USOR SUPERFUND SITE – USOR PROPERTY – AREA OF INVESTIGATION 1

PRELIMINARY CONCEPTUAL PROPERTY MODEL POTENTIAL EXPOSURE MEDIUM ⁽¹⁾	ITERATIVE DATA NEED	APPROACH TO FILL DATA NEED		
		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
Fish/Shellfish ⁽²⁾	<ol style="list-style-type: none"> 1) Identify fish/shellfish species present and affinity for Vince Bayou and Little Vince Bayou near AOI-1. 2) Concentrations of COPCs in fish/shellfish tissue attributable to AOI-1 sources. 3) Assess the potential for fish/shellfish consumption in the area. 	<ol style="list-style-type: none"> 1) Source data (concentrations of COPCs, source type, etc.). 2) Historical information on releases from AOI-1. 3) Surface runoff patterns at AOI-1 to off-property areas, including surface water. 4) Nature and extent of COPCs in on-property and off-property soil. 5) COPC concentration data from samples of surface water, sediment and fish/shellfish. 6) Fish/shellfish advisories and associated data. 7) Other data from trustees. 	<ol style="list-style-type: none"> 1) Identify ongoing and/or historic spills/releases that have or have the potential to impact fish/shellfish. 2) Collect data necessary to characterize aquatic conditions relative to fish in Vince Bayou and Little Vince Bayou (e.g., fish/shellfish species present, property fidelity, prey items, etc.). 3) If necessary based on iterative approach to characterization, collect fish/shellfish samples for analysis of AOI-1 COPCs. 	<ol style="list-style-type: none"> 1) Refine property COPC list by evaluating source area, soil and groundwater sample data. 2) Identify fish/shellfish species present and affinity for property. 3) Collect fish/shellfish samples in Vince Bayou and Little Vince Bayou for analysis of AOI-1 COPCs, if warranted. 4) Evaluate potential for AOI-1 to contribute COPCs to fish/shellfish tissue in Vince Bayou above background concentrations measured in fish from Little Vince Bayou and upstream in Vince Bayou.

TABLE 1
DATA NEEDS SUMMARY
USOR SUPERFUND SITE – USOR PROPERTY – AREA OF INVESTIGATION 1

PRELIMINARY CONCEPTUAL PROPERTY MODEL POTENTIAL EXPOSURE MEDIUM ⁽¹⁾	ITERATIVE DATA NEED	APPROACH TO FILL DATA NEED		
		EXISTING DATA REVIEWED	REMEDIAL INVESTIGATION ACTIVITY	REMEDIAL INVESTIGATION APPROACH AND DATA COLLECTION METHODS
General Data Needs	1) Collect qualitative data needed to support risk assessments such as the presence of T&E species, land use in the vicinity, receptor survey and use restrictions at AOI-1. 2) Identify potential preferential subsurface migration pathways. 3) Identify vegetative cover. 4) Identify climate patterns. 5) Identify land use within the watershed sub-basin. 6) Assess the potential for flooding. 7) Identify historic property ownership and use. 8) Assess the presence and quality of ecological habitat. 9) Identify any restrictive covenants on-property			1) Contact TPWD to determine potential presence of T&E species in the vicinity. 2) Contact the City of Pasadena Engineering Department to obtain a map of all subsurface utilities in the vicinity of AOI-1. In addition, contact the pipeline companies that operate subsurface pipelines in on-property and adjacent properties. 3) Assess the erosion potential of soils, which could create off-property impacts, extending to Vince Bayou. 4) Understand precipitation, prevailing wind direction, and assess how these parameters could impact mobilization of COPCs. 5) Obtain a current aerial photograph and access information from the City of Pasadena to obtain zoning information to define land use. 6) Obtain floodplain maps from FEMA to delineate the 100-year floodplain. 7) Establish historic property ownership and use through obtaining a chain-of-title and historic documents, extending back to a date, prior to property development. 8) Perform a reconnaissance and use public data to identify ecological habitats. 9) Evaluate property record to identify any restrictive covenants on-property.

See table notes on following page.

TABLE 1
DATA NEEDS SUMMARY
USOR SUPERFUND SITE – USOR PROPERTY – AREA OF INVESTIGATION 1

Notes:

- 1) Refer to Exposure Medium column on Figure 1 for human health receptors and on Figure 2 for ecological receptors.
- 2) Sampling of these media to be performed in conjunction with appropriate background sampling, if necessary.
- 3) Color coding per Figures 1 and 2, as follows:

Green – Primary media to be sampled during initial stage of RI/FS.
Blue – Second iteration media to be sampled based on primary media sample data.
Pink – Third iteration media to be sampled based on primary media and second iteration media sample data.
Yellow – For human health risk assessment, exposure medium concentration will be estimated using primary media sample concentrations.

Table 2 - USOR Area of Investigation 1
Metals Concentrations in Soil Samples

Location	Sample ID	Sample Date	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
March 2011 EPA START-3 Sampling Event (HRS, p. 14, Reference 44)																			
SS-01	SS-01-03-51	03/01/11	11000	<1.5J	5.9J	117	<0.75J	<0.75J	15.2J	4.2J	19.3J	53.3J	83.4J	0.21	9.8J	<3.7	<0.75	17.1J	106J
SS-02	SS-02-03-51	03/01/11	21800	<1.3J	11.9J	198	<1.3J	<0.65J	17.2J	6.7J	9J	24.7J	345J	0.12J	12.3J	<6.5	<0.65	29.1J	25.5J
SS-03	SS-03-03-51	03/01/11	20800	<1.3J	205J	402	<3.3J	<0.67J	30.1J	19.1J	15.9J	38.3J	1170J	0.15	21.5J	<16.7	<0.67	48.3J	37.2J
SS-03	SS-03-03-52	03/01/11	18700	<1.3J	464J	718	<13.1J	<0.65J	40.8J	57.7J	<26.2J	58.1J	3600J	0.16	30.9J	<65.4	<0.65	65.9J	36.3J
SS-04	SS-04-03-51	03/01/11	8700	1.8J	10.5J	217	<0.83J	<0.83J	13.5J	3.8J	14.4J	37.3J	240J	<0.12J	8.9J	<4.2	<0.83	15.1J	129J
SS-05	SS-05-03-51	03/01/11	10200	<1.3J	2.1J	117	<0.66J	<0.66J	14.6J	4.3J	10.8J	55J	190J	0.083J	7.9J	<3.3	<0.66	16J	76.7J
2005 TCEQ Investigation (HRS, p.10) (USOR Preliminary Assessment Reference 25) (Sample locations uncertain but are from near the manhole and outfall at the southeast corner of OU-1)																			
T11590-1	T11590-1	10/7/05	---	---	29.3	---	---	---	34.9	---	22.7	36.9	---	0.43	19.6	---	---	---	312
T11590-2	T11590-2	10/7/05	---	---	115	---	---	---	---	---	---	30.7	---	0.09	16.3	---	---	---	203
T11590-3	T11590-3	10/7/05	---	---	55.3	---	---	---	---	---	---	27.0	---	0.14	---	---	---	---	122
T11590-4	T11590-4	10/7/05	---	---	66.5	---	---	---	31.0	---	26.7	68.9	---	0.35	18.3	---	---	---	574
T11591-1 (1A)	T11591-1 (1A)	10/7/05	---	---	46.3	720.0	---	---	47.4	---	49.2	40.8	---	0.20	27.0	---	---	---	489
T11591-2 (2A)	T11591-2 (2A)	10/7/05	---	---	43.4	577.0	---	---	35.8	---	44.5	48.8	---	0.18	26.1	---	---	---	668
T11591-3 (3A)	T11591-3 (3A)	10/7/05	---	---	66.6	1680.0	---	---	61.2	---	81.6	64.3	---	0.46	41.3	---	---	---	1010
USOR Letter to TNRCC (TCEQ) regarding remediation efforts related to spill from west side of bioreactor (HRS, p. 10, Reference 5, p. 504) (Preliminary Assessment Reference 30)																			
A1-1	A1-1	08/31/09	---	---	6.761	76.11	---	<0.5	7.029	---	---	13.63	---	0.068	---	<0.5	<0.5	---	---
A1-2	A1-2	08/31/09	---	---	7.614	57.26	---	<0.5	7.855	---	---	9.468	---	0.167	---	<0.5	<0.5	---	---
A1-3	A1-3	08/31/09	---	---	9.071	82.98	---	<0.5	32.88	---	---	12.88	---	0.127	---	<0.5	<0.5	---	---
A1-4	A1-4	08/31/09	---	---	28.71	67.02	---	0.66	7.964	---	---	12.35	---	0.604	---	<0.5	<0.5	---	---
A1-5	A1-5	08/31/09	---	---	6.34	58.72	---	<0.5	6.831	---	---	12.72	---	0.088	---	<0.5	<0.5	---	---
A1-6	A1-6	08/31/09	---	---	3.757	58.21	---	<0.5	5.08	---	---	8.191	---	0.03	---	<0.5	<0.5	---	---
A1-7	A1-7	08/31/09	---	---	0.917	151.7	---	<0.5	4.078	---	---	7.497	---	0.013	---	<0.5	<0.5	---	---
A1-8	A1-8	08/31/09	---	---	14.34	176.2	---	<0.5	6.747	---	---	15.47	---	0.304	---	<0.5	<0.5	---	---
A1-9	A1-9	08/31/09	---	---	2.135	214	---	<0.5	5.151	---	---	5.997	---	0.025	---	<0.5	<0.5	---	---
A1-10	A1-10	08/31/09	---	---	2.224	64.58	---	<0.5	14.44	---	---	12.74	---	0.033	---	<0.5	<0.5	---	---
A1-11	A1-11	08/31/09	---	---	1.621	202.9	---	<0.5	14.22	---	---	7.826	---	0.011	---	<0.5	<0.5	---	---
A1-12	A1-12	08/31/09	---	---	24.57	72.81	---	<0.5	9.942	---	---	75.9	---	0.165	---	<0.5	<0.5	---	---
A1-13	A1-13	08/31/09	---	---	54.7	196.3	---	<0.5	8.439	---	---	17.55	---	0.274	---	<0.5	<0.5	---	---
A1-14	A1-14	08/31/09	---	---	9.18	88.99	---	<0.5	8.36	---	---	38.46	---	0.302	---	<0.5	<0.5	---	---
A1-15	A1-15	08/31/09	---	---	9.947	75.52	---	<0.5	5.714	---	---	14.45	---	0.57	---	<0.5	<0.5	---	---
A1-16	A1-16	08/31/09	---	---	6.639	66.67	---	<0.5	4.696	---	---	8.191	---	0.236	---	<0.5	<0.5	---	---
A1-17	A1-17	08/31/09	---	---	2.381	59.49	---	<0.5	4.479	---	---	7.32	---	0.053	---	<0.5	<0.5	---	---
A1-19	A1-19	08/31/09	---	---	1.296	87.16	---	<0.5	15.63	---	---	13.72	---	0.015	---	<0.5	<0.5	---	---
A1-20	A1-20	08/31/09	---	---	1.536	139.8	---	<0.5	6.712	---	---	7.89	---	0.019	---	<0.5	<0.5	---	---
A1-4A	A1-4A	09/28/09	---	---	4.47	159.6	---	<0.5	9.06	---	---	2.75	---	<0.01	---	<0.5	<0.5	---	---
A1-8A	A1-8A	09/29/09	---	---	48	144.2	---	<0.5	10.8	---	---	4.88	---	0.055	---	<0.5	<0.5	---	---
A1-12A	A1-12A	09/30/09	---	---	28.7	73.5	---	<0.5	11.4	---	---	9.25	---	1.294	---	0.574	<0.5	---	---
A1-13A	A1-13A	10/01/09	---	---	22.6	75	---	<0.5	11.4	---	---	11	---	0.329	---	<0.5	<0.5	---	---
A1-14A	A1-14A	10/02/09	---	---	13.1	67.5	---	<0.5	8.67	---	---	5.09	---	<0.01	---	<0.5	<0.5	---	---

Table 2 - USOR Area of Investigation 1
Metals Concentrations in Soil Samples

Location	Sample ID	Sample Date	Aluminum (mg/kg)	Antimony (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
2003 USOR Letter to TCEQ Regarding Remediation Efforts Related to "Buried Waste Pit" (Preliminary Assessment, Reference 23)																			
#1, #2, #3 Comp	#1	07/23/03	---	0.047	<0.005	1.76	<0.005	<0.004	<0.007	---	---	<0.01	---	<0.005	<0.015	0.021	<0.006	---	---
#1, #2, #3 Comp	#2	07/23/03	---	0.054	0.012	1.87	<0.005	<0.004	<0.007	---	---	<0.01	---	<0.005	<0.015	<0.005	<0.006	---	---
1991 Espey, Houston & Associates, Phase 2A Environmental Site Assessment (Preliminary Assessment, Ref. 19)																			
B-1 11-12'	B-1 11-12'	09/30/91	---	---	59.6	---	---	---	---	---	4.7	---	---	---	---	---	---	---	---
B-2 11-11.5'	B-2 11-11.5'	09/30/91	---	---	180	---	---	---	---	---	5.4	---	---	---	---	---	---	---	---
B-3 12.5-13'	B-3 12.5-13'	09/30/91	---	---	6120	---	---	---	---	---	3.9	---	---	---	---	---	---	---	---
1998 Extra Environmental Inc. Sampling Report for North American Hide Exporters																			
1	1	02/11/98	---	---	190	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2	2	02/11/98	---	---	120	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3	3	02/11/98	---	---	<2.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
4	4	02/11/98	---	---	95	---	---	---	---	---	---	---	---	---	---	---	---	---	---
5	5	02/11/98	---	---	6.2	---	---	---	---	---	---	---	---	---	---	---	---	---	---
6	6	02/11/98	---	---	180	---	---	---	---	---	---	---	---	---	---	---	---	---	---
7	7	02/11/98	---	---	20	---	---	---	---	---	---	---	---	---	---	---	---	---	---
8	8	02/11/98	---	---	36	---	---	---	---	---	---	---	---	---	---	---	---	---	---
9	9	02/11/98	---	---	25	---	---	---	---	---	---	---	---	---	---	---	---	---	---
10	10	02/11/98	---	---	22	---	---	---	---	---	---	---	---	---	---	---	---	---	---
11	11	02/11/98	---	---	33	---	---	---	---	---	---	---	---	---	---	---	---	---	---
12	12	02/11/98	---	---	62	---	---	---	---	---	---	---	---	---	---	---	---	---	---
13	13	02/11/98	---	---	42	---	---	---	---	---	---	---	---	---	---	---	---	---	---
14	14	02/11/98	---	---	2.7	---	---	---	---	---	---	---	---	---	---	---	---	---	---
15	15	02/11/98	---	---	170	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16	16	02/11/98	---	---	<2.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
17	17	02/11/98	---	---	32	---	---	---	---	---	---	---	---	---	---	---	---	---	---
18	18	02/11/98	---	---	21	---	---	---	---	---	---	---	---	---	---	---	---	---	---
19	19	02/11/98	---	---	<2.5	---	---	---	---	---	---	---	---	---	---	---	---	---	---
20	20	02/11/98	---	---	120	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Notes:

- 1. --- = No value available for that compound for that sample.
- 2. < = not detected above reporting limit
- 3. J = estimated concentration.
- 4. Not all qualifier flags from original data are included in this table.
- 5. Only metals detected in at least one soil sample are included in this table.

Table 3 - USOR Area of Investigation 1 Volatile and Semi-Volatile Organic Compound Concentrations in Soil Samples																	
Location	Sample ID	Sample Date	1,4-Dichlorobenzene (mg/kg)	Benzo (a) anthracene (mg/kg)	Benzo (a) pyrene (mg/kg)	Benzo (b) fluoranthene (mg/kg)	Benzo (g,h,i) perylene (mg/kg)	Benzo (k) fluoranthene (mg/kg)	Chrysene (mg/kg)	Di-n-butylphthalate (mg/kg)	Fluoranthene (mg/kg)	Indeno (1,2,3- cd) pyrene (mg/kg)	Methyl ethyl ketone (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)	Xylenes (mg/kg)
March 2011 EPA START-3 Sampling Event (HRS, p. 14, Reference 44)																	
SS-01	SS-01-03-51	3/1/2011	<0.0051	<0.767	1.32	1.68	1.36	0.98	1.31	<0.767	1.54	1.17	<0.0051	<0.307	0.425	1.56	<0.0051
SS-02	SS-02-03-51	3/1/2011	<0.005	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	<0.737	<0.264	<0.66	<0.005	<0.264	<0.264	<0.264	<0.005
SS-03	SS-03-03-51	3/1/2011	0.702	<0.652	<0.652	<0.652	<0.652	<0.652	<0.652	<0.652	<0.261	<0.652	<0.0057	<0.261	<0.261	<0.261	<0.0057
SS-03	SS-03-03-52	3/1/2011	0.986	<0.646	<0.646	<0.646	<0.646	<0.646	<0.646	<0.652	<0.258	<0.646	<0.0061	<0.258	<0.258	<0.258	<0.0057
SS-04	SS-04-03-51	3/1/2011	<0.0057	<0.784	<0.784	<0.784	<0.784	<0.784	<0.784	<0.784	0.668	<0.784	<0.0057	<0.313	<0.313	0.784	<0.0057
SS-05	SS-05-03-51	3/1/2011	<0.662	1.15	1.68	1.99	1.46	1.26	1.69	<0.662	2.64J	1.21	<0.005	<0.265	0.813J	2.66	<0.005
USOR Letter to TNRCC (TCEQ) regarding remediation efforts related to spill from west side of bioreactor (HRS, p. 10, Reference 5, p. 504) (Preliminary Assessment Reference 30)																	
A1-1	A1-1	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	1.24	0.0059	<3.33	<3.33	<0.005
A1-2	A1-2	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	0.0074	<3.33	<3.33	<0.005
A1-3	A1-3	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-4	A1-4	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-5	A1-5	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-6	A1-6	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-7	A1-7	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-8	A1-8	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-9	A1-9	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-10	A1-10	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-11	A1-11	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-12	A1-12	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-13	A1-13	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-14	A1-14	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-15	A1-15	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-16	A1-16	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-17	A1-17	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-19	A1-19	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
A1-20	A1-20	8/31/2009	<0.005	<3.33	<3.33	<3.33	<4	<3.33	<3.33	<3.33	<3.33	<3.33	<0.005	<0.005	<3.33	<3.33	<0.005
1991 Espey, Houston & Associates, Phase 2A Environmental Site Assessment (Preliminary Assessment, Ref. 19)																	
B-1	B-1 11-12'	9/30/1991	<2.18	<2.18	<2.18	<2.18	<2.18	<2.18	<2.18	2.9	<2.18	<2.18	---	<2.18	<2.18	<2.18	<0.005
B-2	B-2 11-11.5'	9/30/1991	<2.18	<2.18	<2.18	<2.18	<2.18	<2.18	<2.18	7.8	<2.18	<2.18	---	<2.18	<2.18	<2.18	<0.005
B-3	B-3 12.5-13'	9/30/1991	<2.18	<2.18	<2.18	<2.18	<2.18	<2.18	<2.18	6.4	<2.18	<2.18	---	<2.18	<2.18	<2.18	0.028

- Notes:
1. --- = No value available for that compound for that sample.
 2. < = not detected above reporting limit
 3. J = estimated concentration.
 4. Not all qualifier flags from original data are included in this table.
 5. Only compounds detected in at least one soil sample are included in this table.

Table 4 - USOR Area of Investigation 1
Pesticide Concentrations in Soil Samples

Location	Sample ID	Sample Depth (ft below grade)	Aldrin (mg/kg)	alpha-BHC (mg/kg)	beta-BHC (mg/kg)	delta-BHC (mg/kg)	gamma-BHC (mg/kg)	4,4'-DDD (mg/kg)	4,4'-DDE (mg/kg)	4,4'-DDT (mg/kg)	Dieldrin (mg/kg)	Endosulfan Sulfate (mg/kg)	Endrin (mg/kg)	Endrin Aldehyde (mg/kg)	Methoxychlor (mg/kg)
1991 Espey, Houston & Associates, Phase 2A Environmental Site Assessment (Preliminary Assessment, Ref. 19)															
B-1	B-1 11-12'	11/12/13	<0.0027	<0.002	<0.004	<0.006	<0.0027	<0.0074	<0.0024	<0.008	<0.0013	<0.0442	<0.004	<0.0154	<0.118
B-2	B-2 11-11.5'	11-11.5	0.0047	0.024	0.0158	<0.006	<0.0027	0.0094	0.0037	0.0211	<0.0013	<0.0442	<0.004	<0.0154	<0.118
B-3	B-3 12.5-13'	12.5-13	<0.070	<0.05	1.2	0.37	<0.07	3.8	2.6	8.7	1.7	4.6	8.2	4.2	8.4

- Notes:
- 1. --- = No value available for that compound for that sample.
 - 2. < = not detected above reporting limit
 - 3. J = estimated concentration.
 - 4. Not all qualifier flags from original data are included in this table.
 - 5. Only compounds detected in at least one soil sample are included in this table.

Table 5 - USOR Area of Investigation 1
Metals and Pesticides Concentrations in Groundwater Samples

Location	Sample ID	Date Sampled	Arsenic (mg/L)	Copper (mg/L)	alpha-BHC (mg/kg)	beta-BHC (mg/kg)	delta-BHC (mg/kg)	gamma-BHC (mg/kg)
1991, Espey, Houston & Associates (Preliminary Assessment, Ref. 19)								
B-1	B-1	9/30/1991	5.77	0.17	0.00008	0.00022	<0.006	0.00004

Notes:

1. < = not detected above reporting limit
2. Only compounds detected in at least one sample are included in this table.

Table 6 - USOR Area of Investigation 1
Metals Concentrations in Surface Water Samples
2011 Data

Location	Sample ID	Date Sampled	Aluminum (mg/L)	Antimony (mg/L)	Arsenic (mg/L)	Barium (mg/L)	Beryllium (mg/L)	Cadmium (mg/L)	Chromium (mg/L)	Cobalt (mg/L)	Copper (mg/L)	Iron (mg/L)	Lead (mg/L)	Magnesium (mg/L)	Manganese (mg/L)	Mercury (mg/L)	Nickel (mg/L)	Potassium (mg/L)	Selenium (mg/L)	Silver (mg/L)	Vanadium (mg/L)	Zinc (mg/L)
March 2011 EPA START-3 Sampling Event (HRS, p. 14, Reference 44)																						
PPE-01	PPE-01-00-11-20110303	3-Mar-11	0.426 J	<0.002	0.0158 J	0.0704	<0.001	<0.001	0.004 J	<0.001	0.002 J	0.211	0.0018 J	229	0.0336	<0.0002	0.0045	82.3	<0.005	<0.001	0.0009 J	0.0172 J
PPE-02	PPE-02-00-11-20110303	3-Mar-11	0.284 J	<0.002	0.0191 J	0.0655 J	<0.001	<0.001	0.0033 J	<0.001	0.0024 J	<0.2	<0.002	280	0.0338	<0.0002	0.0036 J	97	<0.005	<0.001	<0.005	0.0128 J
PPE-03	PPE-03-00-11-20110302	2-Mar-11	<0.02	<0.002	0.0192 J	0.0789	<0.001	<0.001	0.004 J	<0.001	<0.002	0.202	<0.001	260 J	0.0429	<0.0002	0.0042	90.4 J	<0.005	<0.001	<0.005	0.0131 J
PPE-04	PPE-04-00-11-20110302	2-Mar-11	<0.02	<0.002	0.0188 J	0.0917	<0.001	<0.001	0.0039 J	<0.001	<0.002	0.0977 J	<0.001	285	0.0453	<0.0002	0.0042	95 J	0.0054J	<0.001	0.0012 J	0.0098 J
PPE-05	PPE-05-00-11-20110301	1-Mar-11	<0.02	<0.002	0.0192 J	0.0688	<0.001	<0.001	0.0032 J	<0.001	<0.002	0.141 J	<0.001	258 J	0.0469	<0.0002	0.0039	89 J	0.0105J	<0.001	<0.0024	0.0142 J
PPE-06	PPE-06-00-11-20110301	1-Mar-11	<0.02	<0.002	0.0191 J	0.0695	<0.001	<0.001	<0.002	<0.001	<0.002	0.171 J	<0.001	232	0.0465	<0.0002	0.0041	81	0.0087J	<0.001	0.0015 J	0.0149 J
SED-01	BG-01-00-11-20110303	3-Mar-11	0.069 J	<0.004	0.021 J	0.0582 J	<0.002	<0.001	<0.004	<0.002	<0.004	<0.4	<0.002	240	0.0352	<0.0002	<0.002	85.5	<0.01	<0.001	<0.01	0.0201 J
SED-02	BG-02-00-11-20110301	1-Mar-11	<0.02	<0.002	0.0149 J	0.0728	<0.001	<0.001	<0.002	<0.001	<0.002	0.16 J	0.0016 J	264	0.0426	<0.0002	0.0039	89.8	<0.005	0.0017 J	0.0027 J	0.0141 J
SW-01	SW-01-00-11-20110302	2-Mar-11	<0.02	<0.002	0.02 J	0.0768	<0.001	<0.001	0.0043 J	<0.001	<0.002	0.16 J	<0.001	256	0.0381	<0.0002	0.0041	88.9	<0.005	<0.001	0.002 J	0.0139 J
SW-02	SW-02-00-11-20110302	2-Mar-11	<0.02	<0.002	0.0189 J	0.0738	<0.001	<0.001	0.0042 J	<0.001	<0.002	0.121 J	0.001	267	0.0372	<0.0002	0.0042	92.6	<0.005	<0.001	0.00016 J	0.0125 J
SW-03	SW-03-00-11-20110303	3-Mar-11	1.42	<0.002	0.0169 J	0.083	<0.001	<0.001	0.006 J	0.0018J	0.0058 J	1.24	0.016	245	0.0786	<0.0002	0.0055	86.5	<0.005	<0.001	0.0038 J	0.0347 J
SW-04	SW-04-00-11-20110303	3-Mar-11	0.466	<0.002	0.0148 J	0.0687	<0.001	<0.001	0.0041 J	<0.001	0.002 J	0.247	0.0025	230	0.0344	<0.0002	0.0041	82.5	<0.005	<0.001	0.00021 J	0.0152 J
SW-05	SW-05-00-11-20110303	3-Mar-11	0.118 J	<0.002	0.018 J	0.0612 J	<0.001	<0.001	0.0029 J	<0.001	0.0035 J	<0.2	<0.002	232	0.0314	<0.0002	0.0038 J	82.3	<0.005	<0.001	<0.005	0.015 J
SW-06	SW-06-00-11-20110302	2-Mar-11	0.277	<0.002	0.0143 J	0.0486	<0.001	<0.001	0.0033 J	<0.001	0.0012 J	0.0686 J	<0.001	121	0.0235	<0.0002	0.0035	50.6	<0.005	<0.001	<0.005	0.0185 J
SW-07	SW-07-00-11-20110303	3-Mar-11	0.306	<0.002	0.0132 J	0.0518	<0.001	<0.001	<0.002	<0.001	0.0014 J	0.0986 J	0.001	139	0.0247	<0.0002	0.0038	55.8	<0.005	<0.001	0.00042 J	0.0188 J
SW-08	SW-08-00-11-20110303	3-Mar-11	0.152 J	<0.002	0.0159 J	0.0533 J	<0.001	<0.001	0.0028 J	<0.001	0.0016 J	<0.2	<0.002	169	0.0261	<0.0002	0.0032 J	75.1	<0.005	<0.001	<0.005	0.0131 J
SW-09	SW-09-00-11-20110302	2-Mar-11	<0.02	<0.002	0.0189 J	0.092	<0.001	<0.001	0.0037 J	<0.001	<0.002	0.0942 J	<0.001	288 J	0.0445	<0.0002	0.0042	94.7 J	0.0057J	<0.001	0.00065 J	0.0091 J
SW-10	SW-10-00-11-20110302	2-Mar-11	<0.02	<0.002	0.0185 J	0.0617	<0.001	<0.001	0.0032 J	<0.001	<0.002	0.0932 J	<0.001	229 J	0.0334	<0.0002	0.0037	80.8 J	0.0064J	<0.001	0.0016 J	0.0147 J
SW-11	SW-11-00-11-20110301	1-Mar-11	<0.02	<0.002	0.0168 J	0.0662	<0.001	<0.001	<0.002	<0.001	<0.002	0.101 J	<0.001	217	0.0427	<0.0002	0.0039	78.3	0.0067	<0.001	0.0021 J	0.014 J

- Notes:
1. All surface water samples from Vince Bayou are included on this table, regardless of their location relative to Operable Unit 1 or Operable Unit 2.
 2. Samples SED-01 and SED-02 were collected at background locations
 3. J = estimated concentration.
 4. < = not detected above reporting limit.
 5. Not all qualifier flags from original data are included in this table.
 6. Only compounds detected in at least one sample are included in this table.

Table 7 - USOR Area of Investigation 1
Metals Concentrations in Sediment Samples
2011 Data

Location	Sample ID	Sample Date	Aluminum (mg/kg)	Arsenic (mg/kg)	Barium (mg/kg)	Beryllium (mg/kg)	Cadmium (mg/kg)	Calcium (mg/kg)	Chromium (mg/kg)	Cobalt (mg/kg)	Copper (mg/kg)	Iron (mg/kg)	Lead (mg/kg)	Magnesium (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Nickel (mg/kg)	Potassium (mg/kg)	Selenium (mg/kg)	Silver (mg/kg)	Sodium (mg/kg)	Vanadium (mg/kg)	Zinc (mg/kg)
March 2011 EPA START-3 Sampling Event (HRS, p.14, Reference 44)																							
PPE-01	PPE-01-03-51	3/3/2011	9620	10.3J	103	0.67U	0.67U	20000	20.4J	4J	13.6J	11300J	76.3	3080	164J	0.35	7.2J	1530	3.4 UJ	1	1870	17.1J	71J
PPE-02	PPE-02-03-51	3/3/2011	12800	4.7J	115	0.79U	0.79U	8820	24.9J	5.6J	22.7J	13200J	120	3930	155J	0.32	13J	2040	7.9 UJ	2.3	2180	18.5J	118J
PPE-03	PPE-03-03-51	3/2/2011	8550	2.2J	78.6	0.85UJ	1.1J	17200	14.4J	3.4J	15.5J	10000	57.3J	3140	74.3J	0.11J	7.3J	1620	---	1.1	2490J	13.7J	112J
PPE-04	PPE-04-03-51	3/2/2011	7480	2J	85.2	0.72UJ	0.72UJ	18000	14J	4.6J	13.9J	9740	32J	2790	94.1J	0.064J	7.8J	1420	---	0.72U	2070J	16J	76.3J
PPE-05	PPE-05-03-51	3/2/2011	13300	2.4J	96.4	0.95UJ	0.95UJ	28900	17.2J	4.8J	18.7J	13600	41.2J	4390	123J	0.13J	10.3J	2430	---	0.95U	3080J	18.7J	116J
PPE-06	PPE-06-03-51	3/2/2011	10500	2.6J	102	0.88UJ	0.88UJ	32700	16.4J	4.5J	17.7J	12000	34.8J	3830	118J	0.051J	8.6J	1920	---	0.88U	2080J	17.7J	101J
SED-01	BG-01-03-51	3/3/2011	16900	2.3J	196	0.81J	0.65U	133000	12.4J	4.3J	5.9J	15200J	10.3	6330	148J	0.0083J	9.5J	2970	3.3 UJ	0.65U	1440	20.1J	16.9J
SED-02	BG-02-03-51	3/2/2011	10100	2.3J	81	0.7UJ	0.7UJ	25200	16.2J	4.3J	16.7J	12600	50.5J	3630	158J	0.076J	7.8J	1880	---	0.7U	2120J	16.1J	74J
SW-01	SED-01-03-51	3/2/2011	9760	13.1J	117	0.82UJ	0.82UJ	34100	18.9J	5.7J	15.7J	13700	106J	3420	215J	0.15J	8.9J	1710	---	0.82U	2600J	20J	103J
SW-02	SED-02-03-51	3/2/2011	18900	11.8J	150	0.93J	0.68UJ	29200	13.1J	4.9J	5.2J	16400	15.6J	4140	113J	0.92	7.6J	2230	---	0.68U	2020J	21.2J	16.6J
SW-03	SED-03-03-51	3/2/2011	14400	5.9J	114	0.87U	0.87U	18200	19.9J	4.7J	21.7J	14000J	64.4	4550	91.8J	0.32	10.8J	2360	4.4 UJ	1.7	2460	19.9J	118J
SW-04	SED-04-03-51	3/3/2011	6310	19.3J	109	0.67U	0.67U	9000	15.8J	3.4J	10.4J	6030J	57.5	1770	83.8J	1.8	6.5J	997	3.4 UJ	0.7	982	17.4J	30.6J
SW-05	SED-05-03-51	3/3/2011	8000	1.3J	62	0.74U	0.74U	6880	11.4J	2J	9.7J	8650J	38.4	2280	71J	0.13J	5.5J	1260	3.7 UJ	0.74U	1790	9.8J	65.9J
SW-06	SED-06-03-51	3/3/2011	7700	4J	86.7	0.6U	0.6U	137000	15.9J	3.8J	12.2J	11600J	57.1	4620	305J	0.075J	9J	1080	6 UJ	0.6U	1470	13.9J	132J
SW-07	SED-07-03-51	3/3/2011	10800	2.4J	89	0.69U	0.69U	16000	17J	5J	11.8J	12800J	55	4070	203J	0.14	9.4J	1760	3.5 UJ	0.92	1270	17.7J	87.4J
SW-08	SED-08-03-51	3/3/2011	17100	2.9J	291	1.1J	0.9	8890	40.6J	5.8J	45.3J	16200J	196	5640	116J	0.81	17J	2630	8.2 UJ	7.9	2220	23.9J	160J
SW-09	SED-09-03-51	3/2/2011	12800	2.2J	110	0.74J	0.69UJ	19900	21.1J	4.4J	14.8J	14600	122J	4330	106J	0.33	10.1J	2190	---	1.8	2220J	18.8J	114J
SW-10	SED-10-03-51	3/2/2011	15400	5.9J	178	3.4UJ	0.68UJ	3740	19.6J	26.7J	9.5J	17400	30.1J	2450	1030J	0.013J	14.1J	1740	---	0.68U	1770J	48.7J	13.5J
SW-11, PPE-06A	SED-11-03-51	3/2/2011	2630	2.3J	41.7	0.64UJ	0.64UJ	137000	23.4J	1.6J	8.1J	5640	9.8J	9770	310J	0.027J	4.5J	639U	---	0.64U	1160J	15J	40.1J

Notes:

1. All sediment samples from Vince Bayou are included on this table, regardless of their location relative to Operable Unit 1 or Operable Unit 2.
2. Samples SED-01 and SED-02 were collected at background locations
3. J = estimated concentration.
4. < or U = not detected above reporting limit.
5. Not all qualifier flags from original data are included in this table.
6. Only compounds detected in at least one sample are included in this table.

Table 8 - USOR Area of Investigation 1
Volatile and Semi-Volatile Organic Compound Concentrations in Sediment Samples

Location	Sample ID	Sample Date	Anthracene (mg/kg)	Benzo (a) anthracene (mg/kg)	Benzo (a) pyrene (mg/kg)	Benzo (b) fluoranthene (mg/kg)	Benzo (g,h,i) perylene (mg/kg)	Benzo (k) fluoranthene (mg/kg)	Bis (2-ethylhexyl) phthalate (mg/kg)	Carbon disulfide (mg/kg)	Chlorobenzene (mg/kg)	Chrysene (mg/kg)	Dibenz (a,h) anthracene (mg/kg)	Di-n-octyl phthalate (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)	Indeno (1,2,3-cd) pyrene (mg/kg)	Methyl acetate (mg/kg)	2-Methylnaphth alene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)	Toluene (mg/kg)	Xylenes (mg/kg)
EPA Emergency Response 2011																								
PPE-01	PPE-01-03-51	3/3/2011	<0.289	<0.723	<0.723	<0.723	<0.723	<0.723	<0.723	<0.0982	<0.0982	<0.723	<0.723	<0.723	<0.289	<0.289	<0.723	<0.245	<0.289	<0.289	<0.289	<0.289	<0.0982	<0.196
PPE-02	PPE-02-03-51	3/3/2011	<0.294	0.778	1.26	1.56	1.45J	1.01	<0.735	<0.0999	<0.0999	1.17	<0.735	<0.735	1.58	<0.294	1.1	<0.25	<0.294	<0.294	0.428	1.54	<0.0999	<0.2
PPE-03	PPE-03-03-51	3/2/2011	<0.309	0.934	1.24	1.49	0.892	0.982	7.45	0.146B	<0.1	1.27	<0.772	<0.772	2.28	<0.309	<0.772	<0.25	<0.309	<0.309	0.318	2.43	<0.1	<0.2
PPE-04	PPE-04-03-51	3/2/2011	<0.289	0.873	1.4	1.81	0.805	1.13	1.21	<0.0991	<0.0991	1.54	<0.721	<0.721	2.02	<0.289	0.794	<0.248	<0.289	<0.289	0.56	2.22	<0.0991	<0.198
PPE-05	PPE-05-03-51	3/2/2011	<0.406	1.4	2.16	2.55	1.79	1.65	1.88	<0.0992	<0.0992	2.43	<1.01	<1.01	3.15	<0.406	1.59	<0.248	0.544	0.416	1.25	3.71	<0.0992	<0.198
PPE-06	PPE-06-03-51	3/2/2011	<0.332	1.29	2.01	2.41	1.57	1.62	1.95	<0.0999	<0.0999	2.25	<0.831	<0.831	2.81	<0.332	1.42	<0.25	<0.332	<0.332	0.834	3.37	<0.0999	<0.2
SED-01	BG-01-03-51	3/3/2011	<0.252	<0.629	<0.629	<0.629	<0.629	<0.629	<0.629	<0.099	<0.099	<0.629	<0.629	<0.629	<0.252	<0.252	<0.629	<0.248	<0.252	<0.252	<0.252	<0.252	<0.099	<0.198
SED-02	BG-02-03-51	3/2/2011	<0.278	1.16	1.74	1.9	1.37	1.39	<0.694	<0.0998	<0.0998	1.75	<0.694	<0.694	2.53	<0.278	1.16	<0.249	<0.278	<0.278	0.75	2.74	<0.0998	<0.2
SW-01	SED-01-03-51	3/2/2011	<0.278	2.05	2.82	3.04	2.27	1.99	0.904B	<0.0836	<0.0836	3.02	<0.695	<0.695	4.72	<0.278	2.08	0.485	<0.278	<0.278	1.79	4.73	<0.0836	<0.167
SW-02	SED-02-03-51	3/2/2011	<0.267	<0.668	<0.668	<0.668	<0.668	<0.668	<0.668	<0.0998	<0.0998	<0.668	<0.668	<0.668	0.491	<0.267	<0.668	<0.25	<0.267	<0.267	<0.267	0.513	<0.0998	<0.2
SW-03	SED-03-03-51	3/2/2011	<0.279	1.2	1.69	1.94	1.36J	1.62	<0.699	<0.1	<0.1	1.65	<0.699	<0.699	2.67	<0.279	1.27	<0.25	<0.279	<0.279	0.741	2.19	<0.1	0.2
SW-04	SED-04-03-51	3/3/2011	<0.268	<0.669	<0.669	<0.669	<0.669	<0.669	<0.669	<0.0999	<0.0999	<0.669	<0.669	<0.669	<0.268	<0.268	<0.669	<0.25	<0.268	<0.268	<0.268	<0.268	<0.0999	<0.2
SW-05	SED-05-03-51	3/3/2011	<0.263	1.62	2.5	2.93	2.1J	1.86	<0.657	<0.0999	<0.0999	2.22	0.725	<0.657	3.08	<0.263	1.95	<0.25	<0.263	<0.263	0.711	3.2	<0.0999	<0.2
SW-06	SED-06-03-51	3/3/2011	<0.241	<0.603	1	1.06	0.824J	0.701	<0.603	<0.1	<0.1	0.737	<0.603	<0.603	0.887	<0.241	0.656	<0.25	<0.241	<0.241	0.363	0.968	<0.1	<0.2
SW-07	SED-07-03-51	3/3/2011	<0.27	0.889	1.5	1.87	1.63J	1.33	<0.675	<0.0998	<0.0998	1.44	<0.675	<0.675	2.01	<0.27	1.41	<0.25	<0.27	<0.27	0.579	2.19	<0.0998	<0.2
SW-08	SED-08-03-51	3/3/2011	<0.303	<0.757	0.998	1.21	0.92	<0.757	<0.757	<0.1	<0.1	0.872	<0.757	<0.757	1.07	<0.303	0.774	<0.25	<0.303	<0.303	<0.303	1.14	<0.1	<0.2
SW-09	SED-09-03-51	3/2/2011	<0.279	0.82	1.28	1.29	1.19	1.09	<0.698	<0.0999	<0.0999	1.22	<0.698	<0.698	1.63	<0.279	1.09	<0.25	<0.279	<0.279	0.424	1.53	<0.0999	<0.2
SW-10	SED-10-03-51	3/2/2011	<0.252	<0.63	<0.63	<0.63	<0.63	<0.63	<0.63	<0.0997	<0.0997	<0.63	<0.63	<0.63	<0.252	<0.252	<0.63	<0.249	<0.252	<0.252	<0.252	<0.252	<0.0997	<0.199
SW-11, PPE-06A	SED-11-03-51	3/2/2011	<0.22	<0.55	<0.55	<0.55	<0.55	<0.55	0.563B	<0.0998	<0.0998	<0.55	<0.55	<0.55	<0.22	<0.22	<0.55	<0.25	<0.22	<0.22	<0.22	<0.22	<0.0998	<0.2

- Notes:
1. All sediment samples from Vince Bayou are included on this table, regardless of their location relative to Operable Unit 1 or Operable Unit 2.
 2. Samples SED-01 and SED-02 were collected at background locations
 3. J = estimated concentration.
 4. < or U = not detected above reporting limit.
 5. Not all qualifier flags from original data are included in this table.
 6. Only compounds detected in at least one sample are included in this table.

TABLE 9 – DATA QUALITY OBJECTIVES FOR AOI-1

DQO STEP:	Preliminary Conceptual Site Model Exposure Media
1. State the Problem	<i>Historical information suggests that contamination exists in on-property soil in areas of former operations, and that contaminants may have migrated off-property during unauthorized releases, spills and overland runoff following storm events.</i>
2. Identify the Goal of the Study	<i>Conduct an investigation and assess the potential risks posed by releases of chemicals associated with the USOR Property, assess potential human health and ecological risks associated with past USOR property activities, and develop remedial alternatives to address any unacceptable risks.</i>
AOI-1 ON-PROPERTY GROUNDWATER	
2a. Identify the Principal Study Questions	<ol style="list-style-type: none"> 1. Do COPCs in groundwater exceed applicable state and federal groundwater quality standards or AOI-1-specific risk-based criteria established for human receptors? 2. Do non-aqueous phase liquids (NAPLs) or the potential for NAPL based on COPC concentrations exist in groundwater?
2b. Define Alternative Actions	<i>The alternative actions that could result from the resolution of the principal study questions are to recommend that portions of the USOR Property i) require no further evaluation or selection of a remedy; or ii) warrant additional assessment or selection of a remedy.</i>
3. Identify Information Inputs	<ul style="list-style-type: none"> • Evaluate AOI-1 hydrogeology. • Evaluate concentrations of COPCs in uppermost groundwater-bearing unit. • Perform water well and water use survey of area. • Perform a water well records search within ½-mile of AOI-1. Confirm that nearby properties are provided potable water from the local municipality. • Perform subsurface utility survey to identify obstructions for drilling program and preferential pathways for migration of COPCs. • Identify ongoing and/or historic spills/releases that have or have the potential to impact groundwater. • Evaluate potential for discharge of groundwater to surface water. • Evaluate groundwater data to assess possibility of vapor intrusion (model).
4. Identify the Boundaries of the Study	<ul style="list-style-type: none"> • The spatial boundaries of the project are the groundwater contained within the USOR Property and any down-gradient groundwater that may have been impacted by on-property groundwater. • The PCSMs show the receptors of potential concern for this pathway. • The sampling unit for groundwater is the entire upper-most groundwater bearing unit when evaluating the potential for vapor intrusion, or point of exposure wells if impacted groundwater discharges to surface water, or lower groundwater units if shown to be impacted.

TABLE 9 – DATA QUALITY OBJECTIVES FOR AOI-1

DQO STEP:	Preliminary Conceptual Site Model Exposure Media
<i>AOI-1 ON-PROPERTY SOIL</i>	
2a. Identify the Principal Study Questions	<ol style="list-style-type: none"> 1. Do COPCs in on-property soil pose an unacceptable risk to human health or ecological receptors? 2. Do COPCs in on-property subsurface soil pose an unacceptable risk to human health receptors? 3. What are the general soil characteristics to evaluate impact or COPC mobilization or sequestration in soil? 4. What is surface runoff drainage patterns at AOI-1?
2b. Define Alternative Actions	<p><i>The alternative actions that could result from the resolution of the principal study questions are to recommend that portions of the USOR Property i) require no further evaluation or selection of a remedy; or ii) warrant additional assessment or selection of a remedy.</i></p>
3. Identify Information Inputs	<ul style="list-style-type: none"> • Evaluate lateral and vertical extent of COPCs in samples of AOI-1 surface soil (0 to 0.5 ft bgs), shallow soils (0.5 to 5 ft bgs) and subsurface soil (greater than 5 ft bgs). • Collect general soil chemistry data (pH, TOC, grain size, etc.). • Evaluate topography and preferential surface water drainage pathways. • Identify ongoing and/or historic spills releases that have or have the potential to impact on-property soil.
4. Identify the Boundaries of the Study	<ul style="list-style-type: none"> • The spatial boundaries of the project are the soil contained within the USOR Property and any topographically lower areas that may have been impacted by surface runoff or direct releases. • The PCSMs show the receptors of potential concern for this pathway. • The sampling unit for soil is 0 to 0.5 feet below ground surface (bgs), 0.5 to 5 ft. bgs, and 5 ft. bgs to the top of the saturated zone.

TABLE 9 – DATA QUALITY OBJECTIVES FOR AOI-1

<p align="center"><i>AOI-1 ON-PROPERTY SEDIMENT</i></p> <p align="center"><i>(SOUTHWEST AREAS OF AOI-1 WHERE SURFACE WATER IS PRESENT FOR THE MAJORITY OF THE YEAR)</i></p>	
2a. Identify the Principal Study Questions	<ol style="list-style-type: none"> 1. Do COPCs in on-property sediment pose an unacceptable risk to human health or ecological receptors? 2. What is the nature of habitat in areas where sediment is present?
2b. Define Alternative Actions	<i>The alternative actions that could result from the resolution of the principal study questions are to recommend that portions of the USOR Property i) require no further evaluation or selection of a remedy; or ii) warrant additional assessment or selection of a remedy.</i>
3. Identify Information Inputs	<ul style="list-style-type: none"> • Identify ongoing and/or historic spills/releases that have or have the potential to impact on-property sediment. • Collect sediment samples from areas of standing water on-property.
4. Identify the Boundaries of the Study	<ul style="list-style-type: none"> • The spatial boundaries of the project are the sediments contained within the low-lying areas in the southwest portion of the USOR property. • The PCSMs show the receptors of potential concern for this pathway. • The sampling unit for these sediments is the biologically active zone for the areas with water standing for the majority of the year.
<p align="center"><i>AOI-1 ON-PROPERTY SURFACE WATER</i></p> <p align="center"><i>(SOUTHWEST AREAS OF AOI-1 WHERE SURFACE WATER IS PRESENT FOR THE MAJORITY OF THE YEAR)</i></p>	
2a. Identify the Principal Study Questions	<ol style="list-style-type: none"> 1. Do COPCs in on-property surface water in the southwest portion of the USOR Property pose an unacceptable risk to human health or ecological receptors? 2. What is the general chemistry of on-property surface water? 3. What is the nature of the habitat in areas where on-property surface water is present?
2b. Define Alternative Actions	<i>The alternative actions that could result from the resolution of the principal study questions are to recommend that portions of the USOR Property i) require no further evaluation or selection of a remedy; or ii) warrant additional assessment or selection of a remedy.</i>
3. Identify Information Inputs	<ul style="list-style-type: none"> • Identify ongoing and/or historic spills/releases that have or have the potential to impact on-property surface water. • Collect data necessary to characterize origin of standing water. • Collect surface water samples in standing water for analysis of COPCs.

TABLE 9 – DATA QUALITY OBJECTIVES FOR AOI-1

4. Identify the Boundaries of the Study	<ul style="list-style-type: none"> • The spatial boundaries of the project are the low-lying area at the southwest portion of the USOR Property with standing water. • The PCSMs show the receptors of potential concern for this pathway. • The sampling unit for surface water is a depth approximately halfway between the surface and the bottom of the standing water.
<i>ON-PROPERTY AND OFF-PROPERTY AIR</i>	
2a. Identify the Principal Study Questions	<ol style="list-style-type: none"> 1. Do COPCs in on-property and off-property soil or groundwater pose an unacceptable risk to human health via inhalation? 2. How do characteristics such as the presence and quality of vegetative cover, soil type and local meteorological data effect on- and off-property air concentrations (outdoor ambient air as well as indoor air)?
2b. Define Alternative Actions	<i>The alternative actions that could result from the resolution of the principal study questions are to recommend that portions of the USOR Property i) require no further evaluation or selection of a remedy; or ii) warrant additional assessment or selection of a remedy.</i>
3. Identify Information Inputs	<ol style="list-style-type: none"> 1. Use on-property soil and groundwater COPC concentration data and AOI-1-specific information to estimate or model potential emissions of volatile organic compounds and fugitive dust in on-property and off-property air.
4. Identify the Boundaries of the Study	<ul style="list-style-type: none"> • The spatial boundaries of the project are affected area of soil and groundwater. • The PCSMs show the receptors of potential concern for this pathway. • The sampling unit for this pathway will be surface soil for fugitive dust generation, subsurface for VOC emissions and impacted subsurface soil and groundwater for indoor VOC intrusion.

TABLE 9 – DATA QUALITY OBJECTIVES FOR AOI-1

<i>OFF-PROPERTY SURFACE SOIL</i>	
2a. Identify the Principal Study Questions	<ol style="list-style-type: none"> 1. Do COPCs in off-property soil pose an unacceptable risk to human health or ecological receptors? 2. Do COPCs in on-property and off-property soil or groundwater pose an unacceptable risk to human health via inhalation? 3. What are the general soil characteristics to evaluate impact or COPC mobilization or sequestration in soil? 4. What are surface runoff drainage patterns in the off-property area?
2b. Define Alternative Actions	<i>The alternative actions that could result from the resolution of the principal study questions are to recommend that portions of the USOR Property i) require no further evaluation or selection of a remedy; or ii) warrant additional assessment or selection of a remedy.</i>
3. Identify Information Inputs	<ol style="list-style-type: none"> 1. Evaluate lateral and vertical extent of COPCs in samples of off-property surface soil (0 to 0.5 ft bgs), shallow soils (0.5 to 5 ft bgs) and subsurface soil (greater than 5 ft bgs), depending on the nature of the soil area being investigated.. 2. Collect general soil chemistry data (pH, TOC, grain size, etc.). 3. Evaluate topography and preferential surface water drainage pathways. 4. Identify ongoing and/or historic spills releases that have or have the potential to impact off-property soil.
4. Identify the Boundaries of the Study	<ul style="list-style-type: none"> • The spatial boundaries of the project are the off-property soil outside of the USOR property extending to Vince Bayou. • The PCSMs show the receptors of potential concern for this pathway. The sampling unit for soil is 0 to 0.5 feet below ground surface (bgs), 0.5 to 5 ft. bgs, and 5 ft. bgs to the top of the saturated zone, depending on the nature of the soil area being investigated.
<i>OFF-PROPERTY SURFACE WATER</i>	
2a. Identify the Principal Study Questions	<ol style="list-style-type: none"> 1. Do COPCs in surface water in Vince Bayou and Little Vince Bayou pose an unacceptable risk to human health or ecological receptors? 2. Do COPCs in surface water in background areas pose an unacceptable risk to human health or ecological receptors? 3. What is the general chemistry of surface water (near AOI-1 and in background areas)? 4. What is the watershed sub-basin and what are the associated uses of the off-property surface water? 5. What is the nature of the habitat in areas where off-property surface water is present? 6. What are the surface water flow characteristics in Vince Bayou and Little Vince Bayou?
2b. Define Alternative Actions	<i>The alternative actions that could result from the resolution of the principal study questions are to recommend that portions of AOI-1 i) require no further evaluation or selection of a remedy; or ii) warrant additional assessment or selection of a remedy.</i>

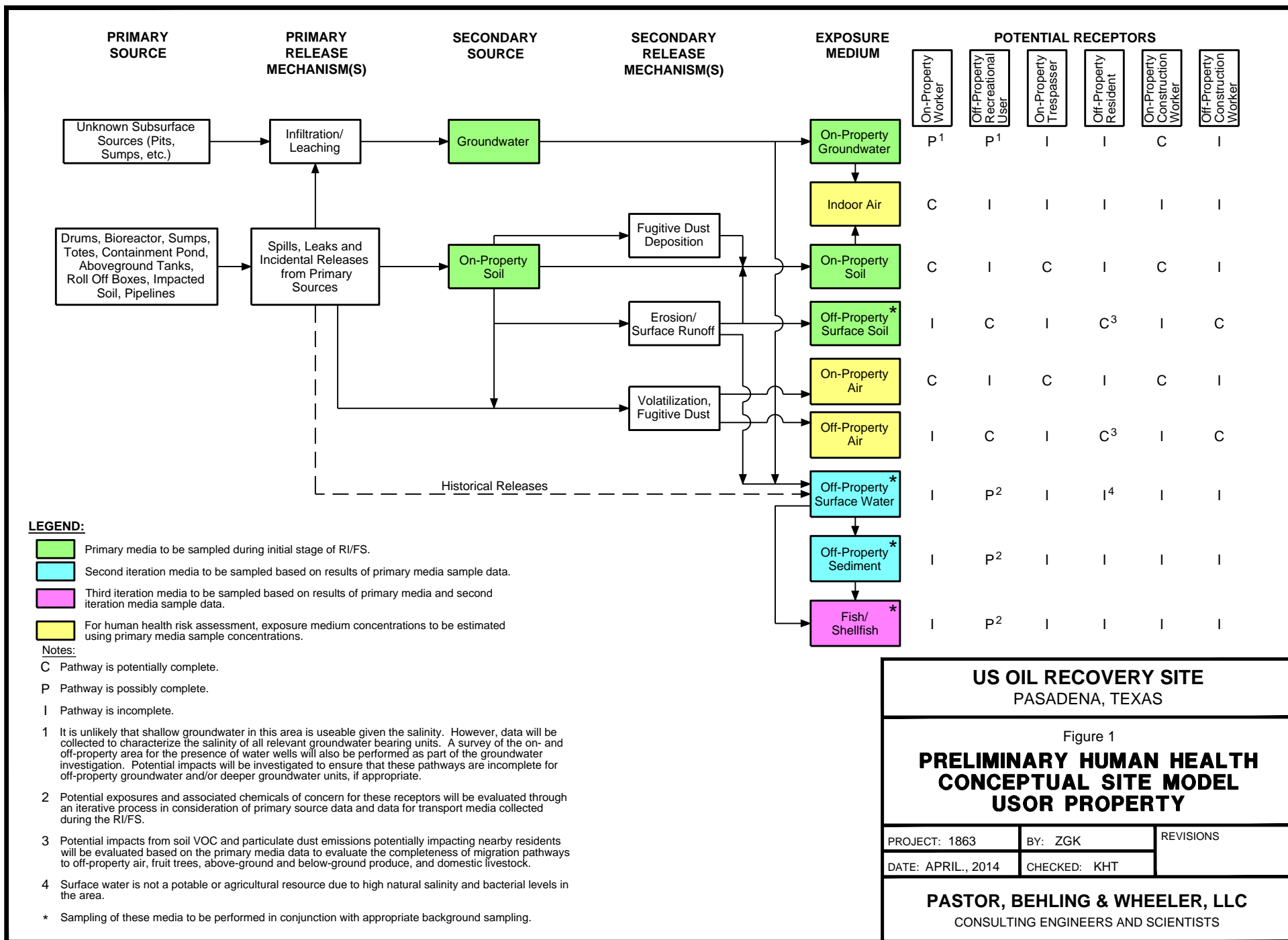
TABLE 9 – DATA QUALITY OBJECTIVES FOR AOI-1

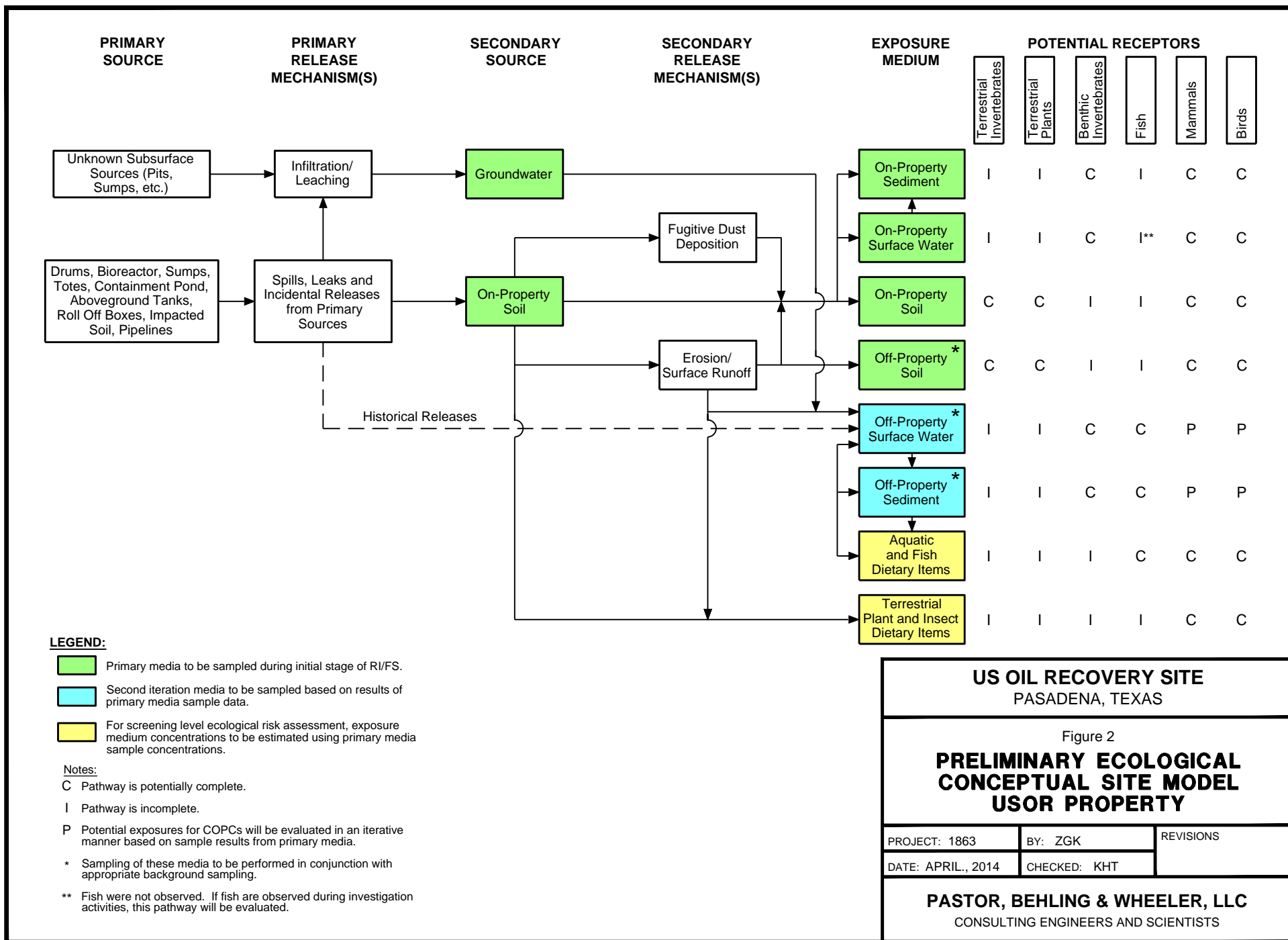
3. Identify Information Inputs	<ol style="list-style-type: none"> 1. Delineate the boundary and drainage within the watershed sub-basin. 2. Identify potential land use practices that might have impacted surface water adjacent to AOI-1. 3. Identify on-going and/or historic spills/releases that have or have the potential to impact surface water. 4. Collect data to characterize surface water flow regime (e.g., flow velocity, groundwater to surface water interactions, etc.). 5. Evaluate the surface water quality and the potential presence of COPCs in surface water.
4. Identify the Boundaries of the Study	<ul style="list-style-type: none"> • The spatial boundaries of the project are the surface water in Vince Bayou and Little Vince Bayou near the USOR Property. • The PCSMs show the receptors of potential concern for this pathway. • The sampling unit for surface water is a depth approximately halfway between the surface and the bottom of the water body in Vince Bayou and Little Vince Bayou and background areas.
<i>OFF-PROPERTY SEDIMENT</i>	
2a. Identify the Principal Study Questions	<ol style="list-style-type: none"> 1. Do COPCs in off-property sediment pose an unacceptable risk to human health or ecological receptors? 2. Do COPCs in off-property sediment in background areas pose an unacceptable risk to human health or ecological receptors? 3. What is the nature of habitat in areas where sediment is present? 4. What is the general chemistry and physical characteristics of off-property sediment (near the USOR Property and in background areas)?
2b. Define Alternative Actions	<i>The alternative actions that could result from the resolution of the principal study questions are to recommend that portions of AOI-1 i) require no further evaluation or selection of a remedy; or ii) warrant additional assessment or selection of a remedy.</i>
3. Identify Information Inputs	<ol style="list-style-type: none"> 1. Identify ongoing and/or historic spills/releases that have or have the potential to impact sediment in Vince Bayou or Little Vince Bayou. 2. Collect sediment samples from Vince Bayou and background areas upstream in Vince Bayou and Little Vince Bayou.
4. Identify the Boundaries of the Study	<ul style="list-style-type: none"> • The spatial boundaries of the project are the sediments in Vince Bayou and Little Vince Bayou near the USOR Property. • The PCSMs show the receptors of potential concern for this pathway. • The sampling unit for these sediments is the biologically active zone in Vince Bayou and Little Vince Bayou and background sediment.

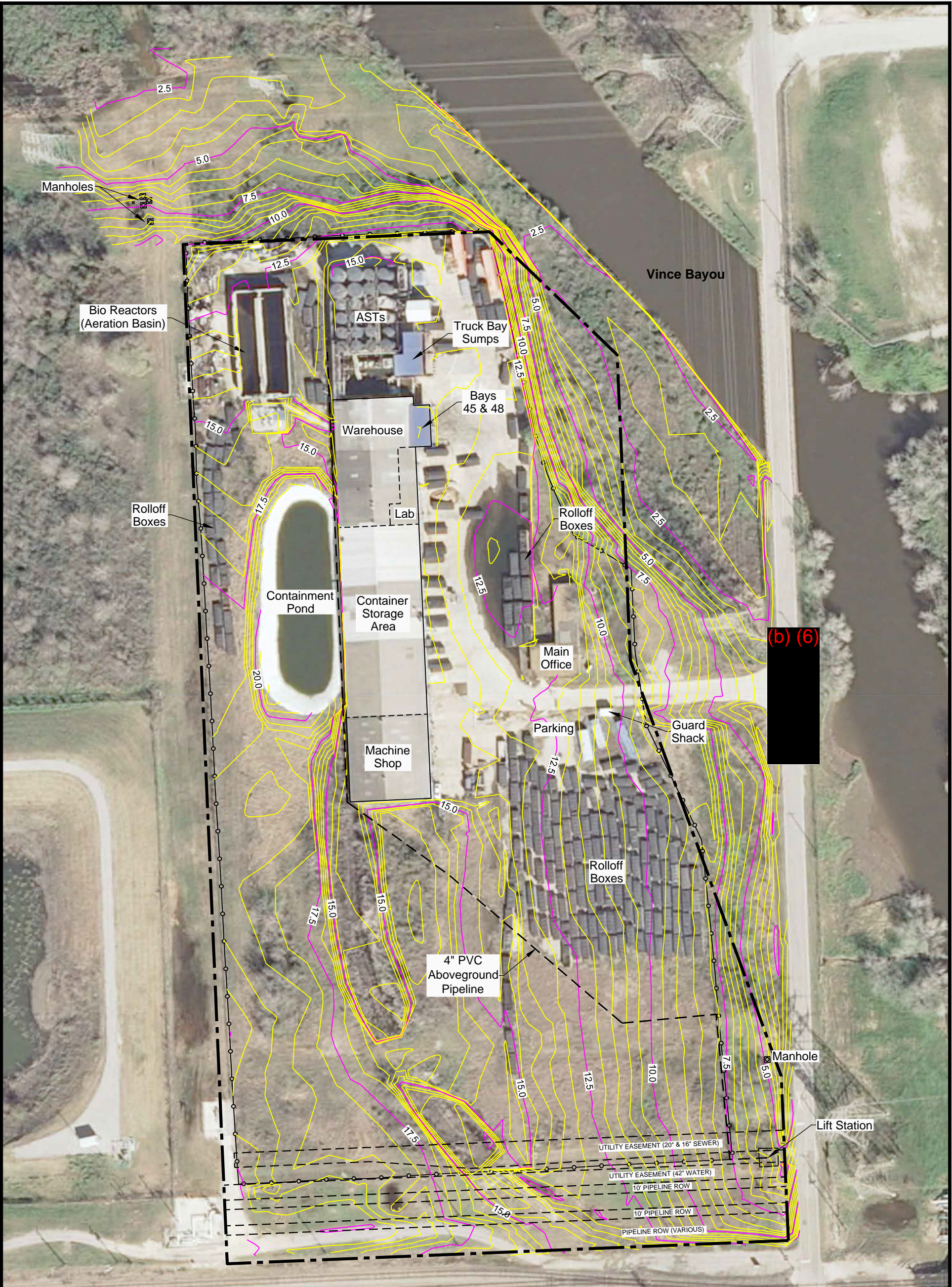
TABLE 9 – DATA QUALITY OBJECTIVES FOR AOI-1

<i>FISH AND SHELLFISH</i>	
2a. Identify the Principal Study Questions	1. Do COPCs in Vince Bayou and Little Vince Bayou fish tissue pose an unacceptable risk to human health or ecological receptors?
2b. Define Alternative Actions	<i>The alternative actions that could result from the resolution of the principal study questions are to recommend that portions of AOI-1 i) require no further evaluation or selection of a remedy; or ii) warrant additional assessment or selection of a remedy.</i>
3. Identify Information Inputs	<ul style="list-style-type: none"> • Collect samples from finfish species (legal size limit) commonly caught in the area and consumed; and samples from shellfish caught in the vicinity of AOI-1. • Measure USOR-Property-related COPCs in fish tissue samples collected (COPCs, excluding essential nutrients, detected above sample quantitation limits (SQLs) and background in the sediment samples will determine the list of COPCs to be analyzed in fish tissue samples). • Validate the analytical data. • If warranted, analyze background fish tissue samples for selected COPCs reported in fish tissue samples. • QA/QC samples: Collect 1 field duplicate and 1 MS/MSD sample per species for COPC analyses. • Analytical method detection limit targets will be identified following sediment sampling.
4. Define Boundaries of the Study	<ul style="list-style-type: none"> • The boundaries are the approximate USOR Property boundaries as extended to the adjacent Vince Bayou. Background samples will be collected from a designated area upstream of this area as well as in Little Vince Bayou. • No vertical boundaries – fish may be sampled from any depth. • The PCSMs show the receptors of potential concern for this pathway. • The sampling unit for fish and shellfish are individual fillet samples although composite shellfish samples may be necessary to provide adequate sample volume.

FIGURES







EXPLANATION

- Approx. Property Boundary
- Approx. Security Fence



Approx. Scale in Feet
0 50 100

Source:
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US OIL RECOVERY
PASADENA, TEXAS

Figure 3

**USOR PROPERTY
AREA OF INVESTIGATION 1
SITE LAYOUT**

PROJECT: 1863	BY: AJD	REVISIONS
DATE: APRIL, 2014	CHECKED: MKW	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Approx. Property Boundary
- Approx. Security Fence
- ▲ Approx. Soil Sample Location
- Approx. Surface Water Sample Location
- Approx. Background Surface Water and Sediment Sample Location

Notes:
1. See tables 2-8 for sample data.



Approx. Scale in Feet
0 75 150

Source:
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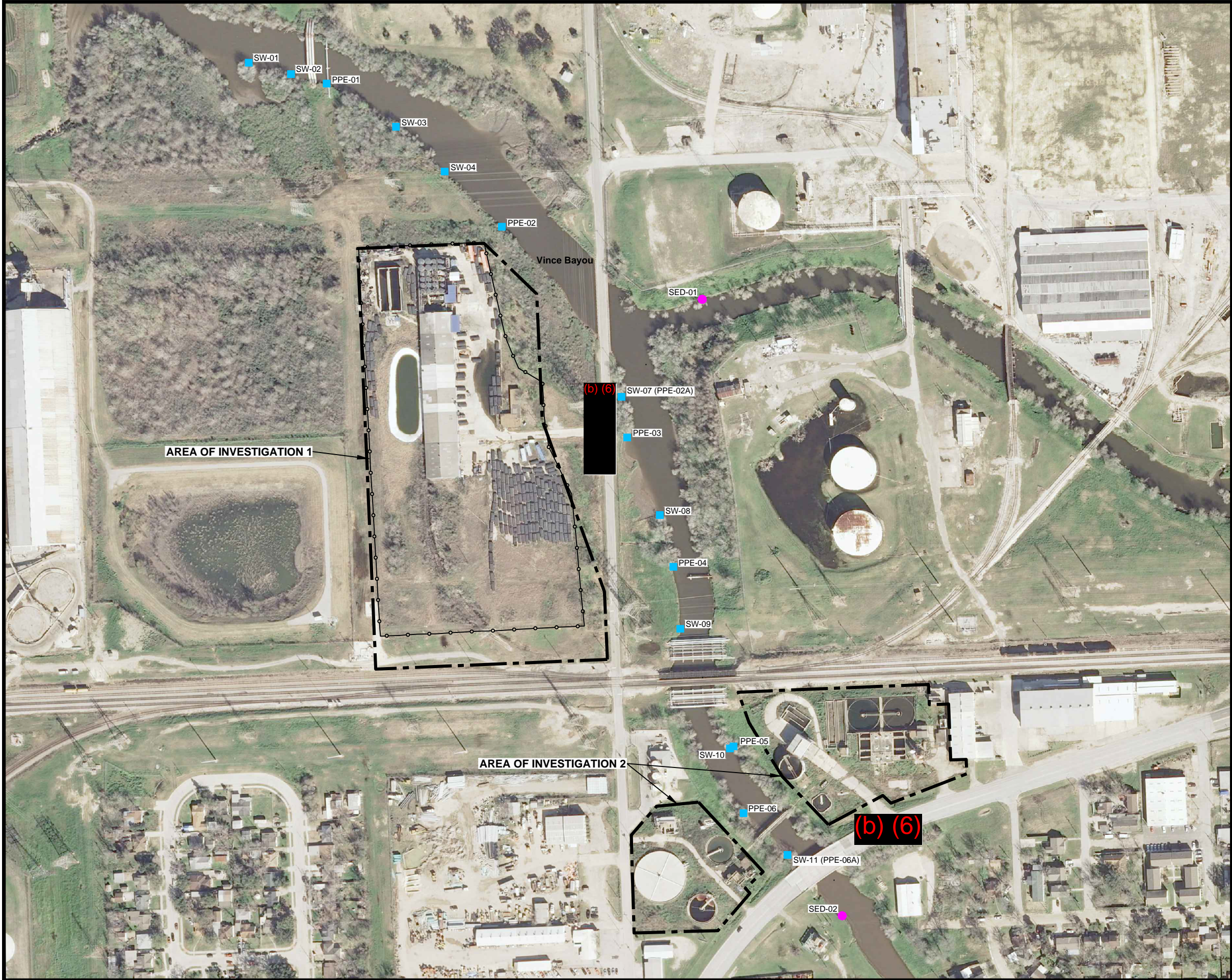
**US OIL RECOVERY
PASADENA, TEXAS**

Figure 4

**AREA OF INVESTIGATION 1
HISTORICAL SAMPLE
LOCATION MAP**

PROJECT: 1863	BY: AJD	REVISIONS
DATE: APRIL, 2014	CHECKED: MKW	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



EXPLANATION

- Approx. Property Boundary
- Approx. Security Fence
- Approx. Surface Water and/or Sediment Sample Location (EPA, 2011)
- Approx. Background Surface Water and Sediment Sample Location



Approx. Scale in Feet
0 125 250

Source:
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**US OIL RECOVERY
PASADENA, TEXAS**

Figure 5

**HISTORICAL SURFACE WATER AND
SEDIMENT SAMPLING LOCATIONS**

PROJECT: 1863	BY: AJD	REVISIONS
DATE: APRIL, 2014	CHECKED: MKW	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

ATTACHMENT D-1

**AREA OF INVESTIGATION 1
PROPERTY HISTORY AND SAMPLING RATIONALE**

ATTACHMENT D-1 – AREA OF INVESTIGATION 1 PROPERTY HISTORY AND SAMPLING RATIONALE

This document summarizes the ownership and operational history for Area of Investigation 1 (AOI-1) at the US Oil Recovery (USOR) Superfund Site, previous and proposed removal actions at AOI-1, and a rationale for the proposed sample locations described in the Scope of Work. This information will also be included in the Remedial Investigation/Feasibility Study (RI/FS) Work Plan and is provided in this document as additional support for the investigative approach described in the Scope of Work.

GENERAL SITE INFORMATION

The USOR Property is located at 400 North Richey Street in Pasadena, Harris County, Texas, 77506 (Figure 3 of the Scope of Work). The approximately 12.2 acre property was most recently used as a used oil processing and waste treatment facility by US Oil Recovery LP (USOR LP). The facility is within a larger industrial complex in the north part of the City of Pasadena, TX. Mixed industrial/residential areas are south of the facility while Vince Bayou and the Houston Ship Channel are to the north.

An office building, security guard shack, and large warehouse (approximately 25,000 square feet in size) are present on the property. The warehouse includes a former laboratory, machine shop, parts warehouse, and a material processing area that included a filter press. Approximately 800 55-gallon drums (some in over-packs) and 212 poly totes (300-400 gallons) containing various industrial wastes are present within the warehouse. A tank farm with approximately 24 aboveground storage tanks (ASTs) containing industrial wastes located within secondary containment is located on the north end of the warehouse. A large, concrete-walled aeration basin (also called the bioreactor) is located west of the tank farm. A containment pond is located west of the warehouse and south of the aeration basin. Approximately 225 roll-off boxes fitted with precipitation covers are located on the property. An inactive rail spur enters the south-central part of the USOR Property from the south and extends north along the west side of the warehouse. A utility right-of-way with various pipelines is present within the southern part of the property and pipelines are also present outside of the property along the eastern and western sides.

The following historical operations have reportedly been conducted at the USOR Property:

- Manufacturing of arsenical, chlorate, and borate pesticide and herbicide products;
- Manufacturing of fertilizer and sulfuric acid;
- Leather tanning and cow hide exporting;
- Storage of various hard goods; and
- Used oil processing and waste treatment.

Potential On-Site Releases

This section describes potential releases from USOR Property operations that may have impacted environmental media from 2005 until late 2010. These releases are described in the HRS Documentation (EPA, 2011) for the USOR Property. If the location of a release listed below is known, it is shown on Figure D-1-1.

October 7, 2005. The TCEQ Region 12 Waste Program received a complaint that alleged USOR LP had discharged contaminated stormwater from a pipe located just outside the entrance to the property and dumped tank bottom waste into a manhole located on the southeast side of the USOR Property (Figure D-1-1). The manhole was connected to the sewer line used by USOR LP to discharge treated wastewater to the City of Pasadena. During the inspection a ditch was observed with dark colored water between N. Richey Street and the manhole. The TCEQ investigator concluded that the water appeared to overflow from the manhole since the vegetation near the manhole was distressed. Soil samples were collected and

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results showed concentrations of arsenic, lead and mercury exceeding TCEQ Commercial/Industrial Protective Concentration Limits (PCLs) for soil protective of Class 1/2 groundwater near the manhole on the southeast side of the site and at the stormwater outfall near the front gate. The analyte list included all RCRA metals, copper, nickel, zinc, BTEX compounds, and TPH. ^{Total}Soil_{Comb} PCLs were not exceeded for any of the compounds evaluated.. There is no indication that this release migrated past the ditch near the facility.

February 23, 2006. A TCEQ Region 12 Waste Program investigator collected soil samples near the northwest corner of the tank farm where an oil spill had occurred; at the north end of the former arsenic burial pit located to the west of the warehouse building; and in a drainage area west of the warehouse building. These samples contained concentrations of arsenic, barium, lead, mercury, several pesticides, SVOCs, and VOCs exceeding commercial/industrial PCLs. Information related to the concentrations of the compounds analyzed and which PCLs were exceeded was not included in the reference to the HRS. USOR LP reported that the oil spill near the northwest corner of the tank farm was a result of 50 to 100 gallons of liquid released onto the ground from a leaking pipeline near the containment wall. According to USOR LP, impacted soil was removed although there is no information related to the analytical testing, area of potential impact, or the removal action. The exact locations of the releases were not provided in the HRS.

December 17, 2007. TCEQ found an unauthorized discharge of wastewater onto the ground due to cracks in the west wall of the aeration basin. Six soil samples were collected: two samples from approximately three feet from the base of the basin, one sample from approximately 58 feet away at the north fence line; two samples from the adjacent downgradient property to the north; and one sample from approximately 88 feet north of the USOR Property. Arsenic, lead and mercury were measured above TRRP Tier 1 residential PCLs. Information related to the concentrations of the compounds analyzed and which PCLs were exceeded was not included in the reference to the HRS. There is no indication that this release migrated beyond the sampling point 88 feet north of the USOR Property. The exact location of the release cannot be determined because a map was not provided in the HRS for this release.

March 14, 2009. USOR LP reported that there was a release of several hundreds of gallons of hazardous waste from the west side of the bioreactors, which migrated north on the property about 150 feet and then outside of the property another 200 feet to the north (Figure D-1-1). Affected soil was excavated and disposed of off-site. No information was provided to indicate what compounds were analyzed for or how it was determined if soil was affected. There is no indication that this release migrated beyond 200 feet to the north of the USOR Property.

September 2009 through January 2010. During several site inspections, roll-off boxes, containers, and drums in the warehouse were observed to be leaking and no secondary containment was present. According to the RCRA §7003 Unilateral Administrative Order, “On December 2, 2009, EPA inspectors observed the stormwater basin overflow with the discharge going to Vince Bayou. An oily sheen was present in the off-site discharge.” Several waste material samples were collected but no samples of environmental media were collected. The exact locations of the releases were not noted and a map was not provided in the HRS.

July 2, 2010. After a large rainfall, the TCEQ visited the site and discovered that it had been abandoned. The TCEQ reported the potential release of hazardous substances because numerous roll-off boxes labeled as containing hazardous waste were filled with liquid, overflowing onto the ground, and the liquid was flowing off-site. Because of the rainfall, Vince Bayou was flooded and breached N. Richey Street. Because of the visual observation of uncontrolled release of liquids from the retention pond, secondary containments, and roll-off boxes labeled as containing hazardous waste, EPA initiated an Emergency

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Response and Removal Action to stabilize the site and prevent further migration of site related constituents off-site. The exact locations of the releases were not noted and a map was not provided in the HRS.

November 4, 2010. The Harris County Public Health and Environmental Services (HCPHES) reported that an oily discharge was occurring from the USOR Property following a heavy rain. EPA found damaged containers in the warehouse and the overflow and off-site migration of liquids to Vince Bayou. The exact location of the release was not noted and a map was not provided in the HRS. No environmental samples were collected during this inspection.

Investigation History

According to the PA (TCEQ, 2011) and other documents, the following environmental investigations have been conducted at the USOR Property. Note that although these investigations are described in various documents and references to concentrations of various constituents are also included, sample location maps and/or actual analytical data are typically not provided in the documents. Furthermore, for many of those investigations where data are provided, the data are of limited value due to the fact that much of the data lack the required backup information such as sample location maps, quality assurance/quality control (QA/QC) data, and/or analytical method information. Data with the appropriate backup information are described in the Existing Data Evaluation section of the Scope of Work, including data summary tables and sample location maps.

1971. Over 100 soil samples were collected in the Spring of 1971 at varying depths. Sample locations were not provided. Arsenic was the only compound evaluated. Samples ranged in concentration less than 10 mg/kg to greater than 3,000 mg/kg in two samples.

1973. According to Progress Report No. 2 Dated October 3, 1973 and associated laboratory reports for several sampling events, water samples were collected in various tanks, a sump pit, and other locations; and soil samples were collected mostly from the west side of the warehouse building (but also in other locations as noted in the laboratory reports). It appears that this work was done in order to focus the areas where excavation would be conducted.

October 30, 1991. A Phase 2A Environmental Site Assessment (ESA) was prepared for Covesud S.A. by Espey, Huston & Associates (EH&A) which described the investigation of a below-grade concrete vault that was located west of the warehouse (Figure D-1-1). Soil and groundwater samples were collected from three borings. Arsenic and several pesticides were measured in soil and groundwater from all three borings while groundwater and soil samples collected at one boring also contained various organic constituents that appeared to be solvent and resin-related compounds.

November 14, 1991. EH&A completed a Phase 2B ESA for Covesud S.A. to further investigate the area near the concrete vault. A below-grade pit (tank) was also discovered within the warehouse. Samples were analyzed for arsenic and copper, VOCs, SVOCs, TPH, and pesticides. Soil and groundwater samples collected from these additional borings associated with the vault contained elevated levels of arsenic, copper and pesticides. The contents of the tank were sampled and indicated the presence of arsenic and copper but not the other analytes.

October 7, 1992. TWC issued a NOV for unauthorized discharge after becoming aware of soil and groundwater contamination at the USOR Property. Specifically, the NOV states, "Analytical results from soil and groundwater samples collected from the above-referenced site indicate a high concentration of arsenic, and high level of total petroleum hydrocarbons, and the presence of several pesticide and organic solvent constituents."

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December 4, 1995. Seven surface soil samples were collected by Environmental Remedies, Inc. and analyzed for TCLP metals and three water samples were collected from three concrete pits containing water and wastewater from prior industrial use as part of this investigation. All samples were analyzed for TCLP metals, VOCs, and SVOCs. Sample locations were not provided although the report indicates they are contained in an appendix to the report. The soil samples indicated the presence of barium and lead at levels below TCLP hazardous criteria. Composite samples from concrete wastewater pit 1 indicated the presence of mercury and several VOCs and SVOCs. Barium, cadmium, chromium and lead were identified in the water sample from pit 2. No results or summary information were provided for pit 3 other than a statement that this was “an outside pit that measures 8’ x 10’ and is nothing more than a water gathering pit adjacent to a water valve/fire hydrant.”

March 2, 1998. Twenty discrete surface soil samples were collected at the west side of the storage warehouse. The soil sample locations occurred beginning approximately 50 feet north of the former vault area and heading south on 50 foot centers. Arsenic concentrations ranged from the detection limit to 190 mg/kg. According to the report from Extra Environmental, Inc. dated March 2, 1998, the data indicated three areas of potential impact with 1) the highest concentrations analyzed occurred north of the former vault area; 2) the second area located south of the former vault area and adjacent to the former warehouse; and 3) the third area located south of the former vault area and west of the former warehouse.

June 24 through July 17, 2001. Soil and groundwater samples were collected throughout the USOR Property by EFEH & Associates as part of an Environmental Site Assessment for Arsenic in Groundwater and Soil on behalf of Mr. Decker McKim of ReMax Southeast. The report, dated August 27, 2001, indicates that the rail spur that ran along the rear of the warehouse has been removed. The current occupants were using the property to store appliances and church storage. Samples were analyzed for arsenic only. Of the 25 soil samples, only one had measured concentrations greater than 200 mg/kg and none of the groundwater samples collected from the boreholes exceeded 0.05 mg/L. The one soil sample with arsenic measured at 219 mg/kg was taken from the center of the pit on the west side of the warehouse (Figure D-1-1). On January 14, 2002, the Corrective Action Section requested additional information and submittal of an Affected Property Assessment Report (APAR).

May 16, 2002. An APAR was prepared and sent to the TCEQ by Mr. Decker McKim on behalf of Hide Exporters of Texas. It appears that this report re-packaged the data that was collected during the summer of 2001 (and submitted at that time as an Environmental Site Assessment by EFEH & Associates). TCEQ issued a notice of deficiency on August 29, 2002 requesting a revised report to fulfill the Agency reporting requirements and further information related to the use of the critical PCL for arsenic of 200 mg/kg. On March 20, 2003, the TCEQ requested additional information after reviewing a response letter dated December 26, 2002 related to the critical PCL used in the evaluation since 18 soil samples exceeded the soil to groundwater PCL of 2.5 mg/kg. In addition, this letter asked that the synthetic precipitate leaching procedure (SPLP) test be performed on soil samples.

April 2003. Twenty-nine additional soil and 10 additional groundwater samples were collected and analyzed for arsenic as documented in a submittal to the TCEQ on May 6, 2003. The dimensions of the arsenic waste pit were delineated by the additional boreholes. The submittal provided information related to the impervious nature of the highly compact silty clay underlying the property and results of the SPLP test. On August 18, 2003, the TCEQ gave conditional approval of the APAR: the soil assessment phase was deemed to be complete but additional information related to groundwater was requested.

September 15, 2003. Additional information was submitted by the property owner related to analytical data from samples collected on September 3, 2003 from the groundwater monitoring wells; and recorded

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deed notices, TRRP Deed Notice and Industrial Solid Waste Deed Notice of Waste Disposal for the arsenic pit, which was left in place at that time.

October 7, 2005. TCEQ Region 12 Waste Program investigator collected three samples of surface soil from an area of distressed vegetation located near a manhole on the southeast side of the USOR Property and analyzed the samples for BTEX, TPH and inorganic compounds. Results showed concentrations of arsenic, lead and mercury exceeding TCEQ Commercial/Industrial PCLs for soil protective of Class 1/2 groundwater near the manhole on the southeast side of the property and at the stormwater outfall near the front gate. It should be noted that $^{Tot}Soil_{Comb}$ PCLs were not exceeded for any of the compounds evaluated, and that the analyte list included all RCRA metals, copper, nickel, zinc, BTEX compounds, and TPH. There is no indication that this release migrated past the ditch near the facility.

February 23, 2006. A TCEQ Region 12 Waste Program investigator collected soil samples near the northwest corner of the tank farm where an oil spill had occurred; at the north end of the former arsenic burial pit located to the west of the warehouse building; and in a drainage area west of the warehouse building. These samples contained concentrations of arsenic, barium, lead, mercury, several pesticides, SVOCs, and VOCs exceeding commercial/industrial PCLs. TCEQ recommended the following corrective action: the horizontal and vertical extent of contamination must be determined, provisions under TRRP must be applied, and an APAR and Remedial Action Plan (RAP) should be submitted. Information related to the concentrations of the compounds analyzed and which PCLs were exceeded was not included in the reference to the HRS. USOR LP reported that the oil spill near the northwest corner of the tank farm was a result of 50 to 100 gallons of liquid released onto the ground from a leaking pipeline near the containment wall. According to USOR LP, impacted soil was removed although there is no information related to the analytical testing, area of potential impact, or the removal action. The exact locations of the releases were not provided in the HRS.

December 17, 2007. TCEQ Region 12 Waste Program investigator collected six soil samples after observing a leak in the aeration basin. Two soil samples were collected approximately three feet from the basin; one soil sample was collected approximately 58 feet away at the north fence line; one sample was taken approximately 88 feet north of USOR Property; and two soil samples were collected on the adjacent down-gradient property to the north. The two samples collected on the adjacent down-gradient property to the north contained petroleum hydrocarbons at levels that required remediation. All six soil samples contained arsenic, lead, and/or mercury exceeding TCEQ TRRP Tier 1 residential PCLs. Information related to the concentrations of the compounds analyzed and which PCLs were exceeded was not included in the reference to the HRS. There is no indication that this release migrated beyond the sampling point 88 feet north of the USOR Property. The exact location of the release cannot be determined because a map was not provided in the HRS for this release.

October 12, 2009. Letter sent by USOR LP reporting completion of remediation activities following a March 14, 2009 release of waste from the aeration basin. Results of confirmation samples collected and analyzed for metals, VOCs, and SVOCs were submitted to TCEQ. Arsenic concentrations off-site were elevated but USOR LP indicated that the bioreactors did not contain arsenic-bearing material since they do not receive arsenic-bearing waste at the facility.

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Removal/Response Actions

This section describes removal or remedial actions that have occurred at the facility based on available documents. In addition, proposed remedial actions by the PRP group are provided. Additional actions may be necessary pending the results of the RI.

Property Owner Actions

December 7, 1973. In a progress report from Rhodia Inc., Chipman Division dated December 7, 1973 related to actions required following a court hearing, a removal action consisting of the removal of 5,000 cubic yards of arsenic-contaminated soil from an area on the west side of the warehouse building (what is now the tank farm) was completed. The contaminated soil was disposed of on-property and treated with lime to immobilize the arsenic. Based on a September 1973 drawing, the borrow pits are located on the southwest portion of the property.

1990. Contaminated soil was removed and placed in an on-site pit on the west side of the warehouse and mixed with lime to form calcium arsenate and thus render it insoluble in water. This is later called the arsenic waste pit.

September 22, 2003. USOR LP removed 1,608 cubic yards of arsenic waste and soil from a buried waste pit on the west side of the warehouse. This material was disposed of off-site. On October 10, 2003, the TCEQ approved the waste removal report. On October 17, 2003, the TCEQ indicated to Hide Exporters of Texas that TRRP Remedy Standard A had been achieved for this area and no post-response action care was needed. This letter addresses two reports that are not in the PA (TCEQ, 2011 or HRS documentation) – Groundwater Sampling and Institutional Control Report dated September 15, 2003 and Groundwater Sampling Report dated September 26, 2003.

July 21, 2005. Sixty cubic yards of soil was excavated near a manhole and ditch associated with surface water discharge from USOR Property. This excavation was reported by USOR LP to be in response to a request from the City of Pasadena Fire Marshal after a paint spill occurred on N. Richey Street. USOR LP employees indicated that the October 2005 incident involving the manhole and an alleged release was a result of Vince Bayou flooding and then becoming stagnant in the excavated areas that were now lower-lying than the rest of the general area.

Letter from USOR LP dated March 2, 2006. USOR LP reported that, on or during a TCEQ inspection on January 10, 2006, 50 to 100 gallons of liquid was released onto the ground from a leaking pipeline near the containment wall by Tank 3. Impacted soil was removed although there is no information related to the analytical testing, area of potential impact, or the removal action.

Letter from USOR LP dated October 12, 2009. Following a release of hazardous waste from the west side of the bioreactors, which migrated north on the property about 150 feet and then outside of the USOR Property another 200 feet to the north, USOR LP initiated response actions that included removing liquids by vacuum truck and removal of about 3 inches of soil by dozer, backhoe and hand excavation from the affected areas. 115 cubic yards of soil was disposed of off-site in the Fort Bend Landfill. Confirmation samples were collected and analyzed for metals, VOCs, and SVOCs to confirm that site remediation objectives (Tier 1 Commercial/Industrial Soil PCLs) had been met within one week following a March 14, 2009 release of waste from the aeration basin. Arsenic concentrations off-site were elevated but USOR LP indicated that the bioreactors did not contain arsenic-bearing material since they do not receive arsenic-bearing waste at the facility.

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EPA Lead

August 2, 2010. EPA completed its Emergency Response and Removal at the site, which included securing and inventorying 225 roll-off boxes, 797 drums, and 212 poly totes and disposing of approximately 392,000 gallons of non-hazardous material off-site.

November 4, 2010. Following a heavy rain and observing damaged containers in the warehouse leaking and migrating off-site, EPA recovered approximately 410,000 gallons of non-hazardous oily liquid waste from the north and south secondary containment (tank farm) areas, sumps and bays, and parking lot. In addition, nine vacuum boxes of non-hazardous sludge waste and four vacuum boxes of hazardous sludge removed from various tanks were disposed of off-site. EPA personnel completed the emergency response on December 20, 2010.

PRP Removal Actions

The PRP Group is in the process of implementing a series of removal actions to address some of the potential source areas on the USOR Property. These removal actions are being performed pursuant to the Removal Action AOC dated August 25, 2011. Specific removal action scopes were described in addenda to the Site Stabilization and Monitoring Work Plan submitted in accordance with the Removal Action AOC requirements. Work Plan Addendum No. 1, dated April 20, 2012, described the approach and procedures for removal and off-site disposal of liquids and solids from the bioreactor followed by bioreactor demolition. The bioreactor liquids were removed in accordance with this addendum in the summer of 2012. Subsequent sampling of the bioreactor solids indicated that due to the characteristics of those materials a different removal approach would be needed. Work Plan Addendum No. 2, dated July 29, 2013, provided the approach and procedures for removal and off-site disposal of the bioreactor solids and other containerized materials, including liquids and solids in the 225 roll-off boxes associated with the former USOR LP operations. Removal of the roll-off box liquids has been performed. Removal of bioreactor and roll-off box solids is currently underway. The discharge of approximately 600,000 gallons of water from the containment pond to Vince Bayou was performed in December 2013 in accordance with an authorization from the EPA and TCEQ. Additional discharges from the pond may be performed, as warranted. Future removal actions are intended to address the contents of the aboveground storage tanks (and associated sumps and containment areas and totes/drums within the warehouse.

SAMPLING RATIONALE

SOIL SAMPLE LOCATIONS

On-property and off-property soil sample locations (Figure 6 of the Scope of Work) and information relied upon to determine sampling locations is presented below. This information is based on review of historic Site documents, historic aerial photographs (attached), and reconnaissance observations at the USOR Property.

Soil samples will be collected to evaluate the lateral and vertical extent of constituents of potential concern (COPCs) in soils. Soil sample collection intervals would be based on location specific information (i.e., deeper samples collected from “source” or “process related” areas and shallower samples collected from surface water run-off areas) and are anticipated to include one or more of the following intervals; surface soil (0 to 0.5 ft bgs), shallow soils (0.5 to 5 ft bgs), and subsurface soil (greater than 5 ft bgs) as described in the Scope of Work.

Preliminary soil sample locations are subject to revision based on the data and information collected during RI/FS Work Plan preparation and/or during the field investigation.

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PROPERTY HISTORY AND SAMPLING RATIONALE**

On-Property Soil Boring Location Rationale

Sample Location	Sample Location Rationale
SB-1	Railroad spur loading/unloading pad observed in the 1944 aerial photograph (attached).
SB-2,3	Lack of vegetation in this area on aerial photographs such as 1978, as well as text in historic reports regarding burial of arsenic contaminated soils in this general location.
SB-4	Disturbed soil based on 2004 and 2008 aerial photographs.
SB-7	Disturbed soils on the southeastern portion of the property based on 2004 aerial photograph.
SB-9,10,11, 65, 66	Southeastern tank/roll-off box storage area used for the temporary containment of waste material.
SB-12	Disturbed soils along the eastern property boundary based on 1944 aerial photograph and location of tank/roll-off box storage area used for the temporary containment of waste material.
SB-13	Disturbed soils on the south-central portion of Site based on 2004, 2005, and 2007 aerial photographs; and location of tank/roll-off box storage area used for the temporary containment of waste material.
SB-14	Stockpiled equipment on the southeast corner of the warehouse based on 2005 aerial photograph.
SB-15	Equipment staging area east of the machine shop based on 2005 aerial photographs.
SB-16	Soil sample collected in 2001 with elevated arsenic concentration.
SB-17	Stockpiled material west of the machine shop and south of the containment basin based on 1978, and 2006 aerial photographs.
SB-18	Drainage ditch enters the property from the western property based on the 1944 aerial photograph.
SB-19	Drainage ditch extending from the western property dead ends at the railroad tracks, west of the warehouse, based on the 1953 aerial photograph.
SB-20, 67, 68	Northwestern property boundary adjacent to the containment pond and in the vicinity of the tanks/roll-off boxes used for the temporary containment of waste material.
SB-21	Immediately west of the containment pond.
SB-22	Possible stockpiled material located to the west of the warehouse based on the 1978 aerial photograph, possible stockpiled material located to the west of the containment pond in the 2006 aerial photograph, and location of tanks/roll-off boxes used for the temporary containment of waste material.
SB-23	Underground vault and run-off area west of the warehouse in numerous aerial photographs.
SB-24	Five cylindrical and four square tanks/pits west of the warehouse based on the 1953 aerial photograph, soil disturbance west of the warehouse based on the 1989 aerial photograph, drainage path extending north from containment pond observed in the 2005 aerial photograph, and stockpiled material north of the containment pond as observed in the 2006 aerial photograph.
SB-25	Soil sample collected on 1998 with elevated arsenic concentration.
SB-26	Drainage path extends north from the pit/pad in 1995 aerial photograph, bare soil along the northwestern property boundary based on 2002 aerial photograph, stockpiled material in the 2004 aerial photograph, and location of tanks/roll-off boxes used for the temporary containment of waste material.
SB-27	West of the bioreactors where tanks/roll-off boxes used for the temporary containment of waste material.
SB-28	Bare soil areas along the northwestern Site property boundary based on 2002 aerial

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PROPERTY HISTORY AND SAMPLING RATIONALE**

	photograph.
SB-29	Surface water drainage path away from bioreactors, based on Site reconnaissance observations.
SB-30	Bare soil area in the 2005 and 2007 aerial photographs, north of the containment pond, and tanks/roll-off boxes used for the temporary containment of waste material.
SB-31	Stockpiled material west of the AST area in the 1978 and 2004 aerial photographs, northwestern Site property boundary and around the aeration basin, and tanks/roll-off boxes used for the temporary containment of waste material.
SB-32	Bare soils north of the ASTs based on the 2007 aerial photograph.
SB-33	Bare soil on the north property boundary on 1953 aerial photograph, stockpiled material on the northeast corner of the Site based on 2004 aerial photograph, and tanks/roll-off boxes used for the temporary containment of waste material.
SB-40	Bare soil that appears to receive runoff from the gravel parking area north of the entrance road, based on the 2007 aerial photograph.
SB-41	Surface water accumulation area that drains to the east, just northwest of the office building, based on visual observations and aerial photographs (e.g., 2011).
SB-42	Disturbed soils along the east boundary in the 1944 aerial photograph, and surface water drainage path observed during Site reconnaissance.
SB-43	Disturbed soil south of office building as observed in the 1944 aerial photograph.
SB-44	Surface water drainage area along southern entrance road based on reconnaissance observations (see 2011 aerial photograph)
SB-45	Adjacent and southeast of AST loading/unloading area (see 2007 aerial photograph).
SB-46	Adjacent and northeast of AST loading/unloading area (see 2007 aerial photograph)
SB-85	Adjacent to aboveground pipeline
SB-86	Adjacent to aboveground pipeline
SB-87	Adjacent to aboveground pipeline
SB-88	Adjacent to aboveground pipeline

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PROPERTY HISTORY AND SAMPLING RATIONALE**

Off-Property Soil Boring Location Rationale

SB-5	Storm water appears to enter the property at this location from the south, based on aerial photographs and property visit visual observations.
SB-6	Storm water drainage ditch west of N. Richey Street at southeast property boundary.
SB-8	Soil sample next to manhole where TCEQ observed discharge on 10/7/2005 and collected soil samples that were measured with elevated arsenic concentrations.
SB-34	Disturbed soil at the northeast corner of the property based on the 1989 aerial photograph.
SB-35	Drainage from earthen/gravel parking area east of the warehouse based on the 2002 aerial photograph.
SB-36	Drainage from parking area east of the AST area based on 2008 aerial photograph, and tanks/roll-off boxes used for the temporary containment of waste material.
SB-37	Bare soil adjacent and east-northeast of sludge bed based on 1953 aerial photograph and historical USOR Property drawings.
SB-38	Sludge bed on the northeast corner of the property based on the 1953 aerial photograph.
SB-39	Bare soil that appears to receive runoff from the gravel parking area north of the entrance road, based on the 2007 aerial photograph.
SB-47	Storm water drainage ditch east of N. Richey Street.
SB-48	Surface water discharge point into Vince Bayou.
SB-49	Storm water drainage ditch east of N. Richey Street, east of the entrance drive.
SB-50	Storm water drainage ditch west of N. Richey Street and north of the entrance drive.
SB-51	Bare soil north of the entrance road, between N. Richey Street and the entrance gate, based on the 2004 aerial photograph.
SB-52	Gravel parking area north of the entrance road to the property, prior to entering the property, based on the 2005 aerial photograph.
SB-53	Storm water drainage ditch east of N. Richey Street.
SB-54	Storm water drainage ditch west of N. Richey Street, where surface water discharges into Vince Bayou.
SB-55	Storm water drainage northeast of the property, where surface water discharges into Vince Bayou.
SB-56	Surface water discharge into Vince Bayou.
SB-57	Surface water discharge into Vince Bayou.
SB-58	Bare soil disturbance north of the property based on 1953 aerial photograph.
SB-59	Storm water run-off from material stockpiled on northern portion of property based on 1978 aerial photograph.
SB-60	Soil sample collected on 12/17/2007 where TCEQ observed run-off from a release at the bioreactor.
SB-61	Stockpiled material north of the property boundary in the 1978 aerial photograph and bare soil area north of property based on 2004 aerial photograph.
SB-62	Bare earthen area north of Site based on 2004 aerial photograph.
SB-63	Bare earthen area north of Site based on 2004 aerial photograph.
SB-64	Bare earthen area north of Site based on 2004 aerial photograph.
SB-69	Storm water appears to enter the property at this location from the south, based on aerial photographs and property visit visual observations.
SB-70	Storm water appears to enter the property at this location from the south, based on aerial photographs and property visit visual observations.
SB-71	Adjacent to location of tank/roll-off box storage area used for the temporary containment of waste material.
SB-72	Adjacent to location of tank/roll-off box storage area used for the temporary containment

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	of waste material.
SB-73	Adjacent to location of tank/roll-off box storage area used for the temporary containment of waste material.
SB-74	Adjacent to location of tank/roll-off box storage area used for the temporary containment of waste material.
SB-75	Adjacent to the containment pond and in the vicinity of the tanks/roll-off boxes used for the temporary containment of waste material.
SB-76	Adjacent to the containment pond and in the vicinity of the tanks/roll-off boxes used for the temporary containment of waste material.
SB-77	Adjacent to the containment pond and in the vicinity of the tanks/roll-off boxes used for the temporary containment of waste material.
SB-78	Adjacent to the containment pond and in the vicinity of the tanks/roll-off boxes used for the temporary containment of waste material.
SB-79	Adjacent to bioreactor and tank area
SB-80	Adjacent to bioreactor and tank area
SB-81	Adjacent to bioreactor and tank area
SB-82	Adjacent to tanks/roll-off boxes used for the temporary containment of waste material and in area of drainage away from parking lot
SB-83	Adjacent to lift station on Southeast corner of property
SB-84	Adjacent to lift station on Southeast corner of property

MONITOR WELL SAMPLE LOCATIONS

Presented below is a description of on-property and off-property monitor well locations (Figure 6 of the Scope of Work) based on review of historic documents, historic aerial photographs, and reconnaissance observations. Monitor wells will be completed within the corresponding soil boring.

Preliminary monitor wells sample locations are subject to revision based on the data and information collected during RI/FS Work Plan preparation and/or during the field investigation.

Sample Location	Sample Location Rationale
MW-1 (SB-3)	Southwestern corner of the property where a lack of vegetation and notes in reports reference burial of arsenic impacted soils. Assumed to be hydraulically up-gradient of the main operational area.
MW-2 (SB-7)	Southeastern corner of the property where disturbed soils were observed. Assumed to be hydraulically up-gradient of the main operational area.
MW-3 (SB-11)	Southeastern portion of the property where tanks/roll-off boxes are used for the temporary containment of waste material. Assumed to be hydraulically up-gradient of the main operational area.
MW-4 (SB-44)	Surface water drainage area along southern property entrance road based on reconnaissance observations. Assumed hydraulically down-gradient of warehouse maintenance area.
MW-5 (SB-42)	Near the east-central property boundary, northeast of the office where a soil disturbance was noted and adjacent to a surface water drainage path extending from the concrete truck staging area. Assumed to be hydraulically down-gradient of the warehouse maintenance area.
MW-6 (SB-21)	West of the containment pond where historic excavation was performed. Assumed to be hydraulically up-gradient of operational area.
MW-7 (SB-39)	Bare soil that appears to receive runoff from the gravel parking area north of the entrance road, based on the 2007 aerial photograph. Assumed hydraulically down-

ATTACHMENT D-1 – AREA OF INVESTIGATION 1 PROPERTY HISTORY AND SAMPLING RATIONALE

	gradient of warehouse container storage area and containment pond.
MW-8 (SB-36)	Drainage from parking area east of the AST area based on 2008 aerial photograph, and tanks/roll-off boxes used for the temporary containment of waste material. Assumed hydraulically down-gradient of AST areas.
MW-9 (SB-33)	Near the northern property boundary in areas of bare soil disturbances and where tanks/roll-off boxes are used for the temporary containment of waste material. Assumed to be hydraulically down-gradient of the main AST area.
MW-10 (SB-32)	Bare soils north of the ASTs based on the 2007 aerial photograph. Assumed to be hydraulically down-gradient of the main AST area.
MW-11 (SB-29)	Surface water drainage path away from bioreactor, based on reconnaissance observations. Assumed hydraulically down-gradient of the bioreactor.

SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS

Presented below is a description of on-property surface water and sediment sample locations (Figure 6 of the Scope of Work) based on review of historic documents, historic aerial photographs, and reconnaissance observations.

Preliminary surface water and sediment sample locations are subject to revision based on the data and information collected during RI/FS Work Plan preparation and/or during the field investigation.

Sample Location	Sample Location Rationale
SW-1 SED-1, SED-2, SED-3	Former railroad spur area in southwest central portion of Site. Observed to retain water based on reconnaissance.
SW-2, SED-4, SED-5, SED-6	Former railroad spur area in south central portion of Site. Observed to retain water based on reconnaissance.

As indicated in the Scope of Work, off-property sediment and surface water sample locations will be determined based on the information obtained during on-property soil, groundwater, surface water and sediment sampling and off-property soil and groundwater sampling.

REFERENCES

Texas Commission on Environmental Quality (TCEQ), 1997. Impacts of Point and Nonpoint Sources on Vince Bayou and Little Vince Bayou Segment 1007 of the Houston Ship Channel. Prepared by Greg Conley. Field Operations Division. AS-130/SR. May 1997 (document indicates 1977 but based on the Commissioners and TNRCC letterhead and date of data presented, it is believed that the document is from 1997).

Texas Commission on Environmental Quality (TCEQ), 2011. Preliminary Assessment Report. US Oil Recovery, LLC. Pasadena, Harris County, Texas. TXR000051540. April.

U.S. Environmental Protection Agency (EPA), 2011. Hazard Ranking System (HRS) Documentation Record. US Oil Recovery. Site Spill Identifier No.: A6X7. Cerclis Site ID No. TXN000607093. September.



EXPLANATION

- - - - - Approx. Property Boundary
- Approx. Security Fence



Approx. Scale in Feet
0 60 120

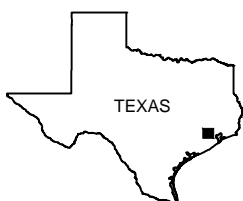
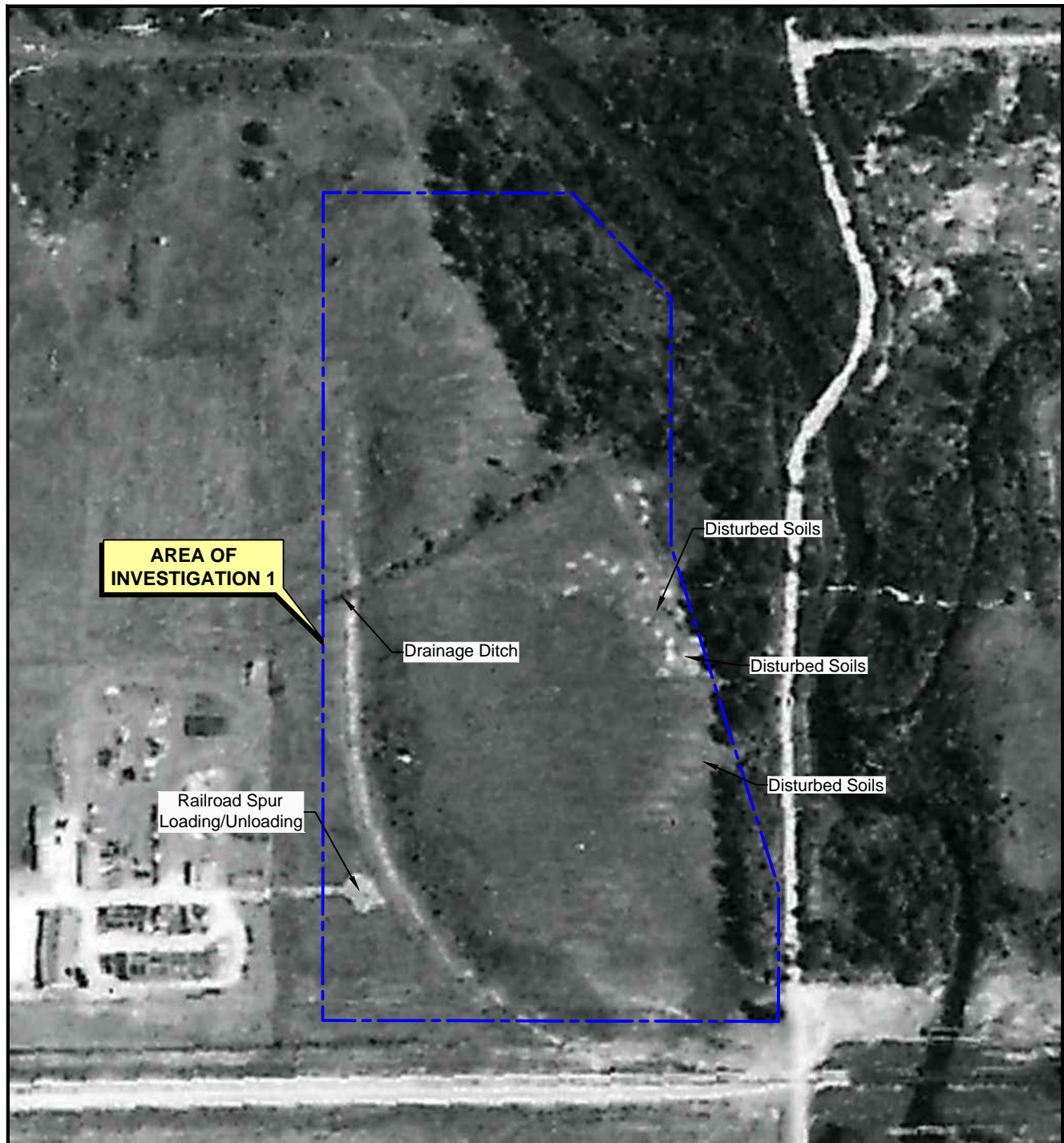
Source:
Houston-Galveston Area Council, April 2012 Image, 2012 Aerial Imagery Data is the sole property of Houston-Galveston Area Council, which reserves all rights thereto. Use or reproduction of this data is strictly prohibited absent written consent from the Houston-Galveston Area Council.

US OIL RECOVERY
PASADENA, TEXAS

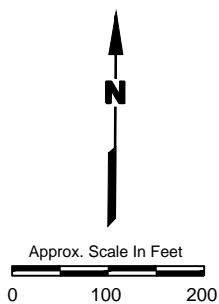
Figure D-1-1
USOR PROPERTY
AREA OF INVESTIGATION 1 (AOI-1)
LOCATIONS OF HISTORIC
RELEASES AND INVESTIGATIONS

PROJECT: 1863	BY: AJD	REVISIONS
DATE: APRIL, 2014	CHECKED: MKW	

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AERIAL PHOTO LOCATION



SOURCE:
Base map from Google Earth, dated December 1944.

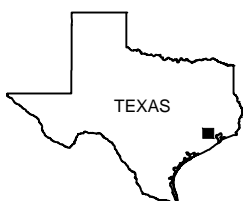
US OIL RECOVERY
PASADENA, TEXAS

Figure D-1-2

1944 AERIAL PHOTOGRAPH

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AERIAL PHOTO LOCATION



Approx. Scale In Feet

0 100 200

SOURCE:
Base map from Google Earth, dated December 1953.

US OIL RECOVERY
PASADENA, TEXAS

Figure D-1-3

1953 AERIAL PHOTOGRAPH

PROJECT: 1863

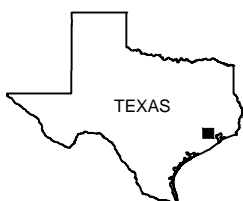
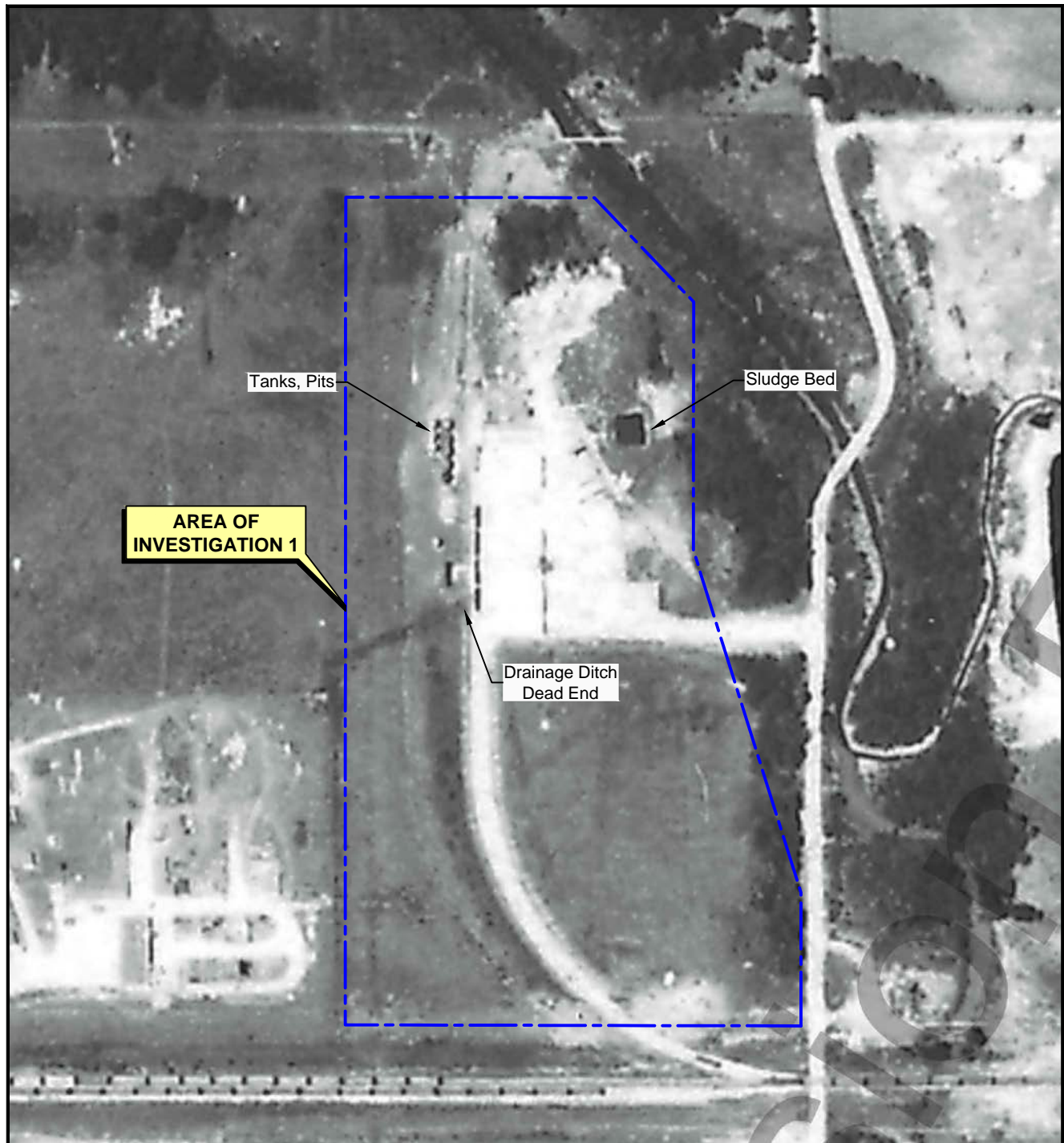
BY: AJD

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AERIAL PHOTO LOCATION



Approx. Scale In Feet
0 100 200

US OIL RECOVERY
PASADENA, TEXAS

Figure D-1-4

1953 AERIAL PHOTOGRAPH

PROJECT: 1863

BY: AJD

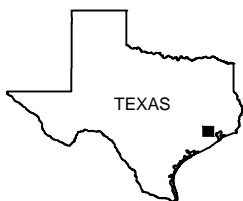
REVISIONS

DATE: APRIL, 2014

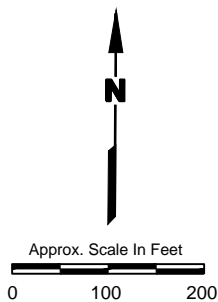
CHECKED: MKW

PASTOR, BEHLING & WHEELER, LLC
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SOURCE:
Base map from EDR Report dated August 13, 2012, Pasadena, TX.



AERIAL PHOTO LOCATION



SOURCE:
Base map from EDR Report dated August 13, 2012, Pasadena, TX.

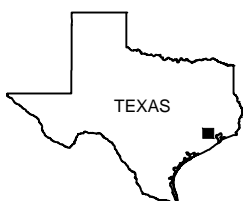
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PASADENA, TEXAS

Figure D-1-5

1962 AERIAL PHOTOGRAPH

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AERIAL PHOTO LOCATION



Approx. Scale In Feet
0 200 400

SOURCE:
Base map from Google Earth, dated December 1978.

US OIL RECOVERY
PASADENA, TEXAS

Figure D-1-6

1978 AERIAL PHOTOGRAPH

PROJECT: 1863

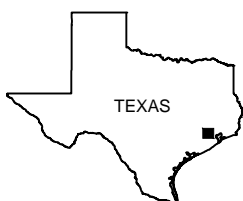
BY: AJD

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AERIAL PHOTO LOCATION



Approx. Scale In Feet
0 100 200

SOURCE:
Base map from EDR Report dated August 13, 2012, Pasadena, TX.

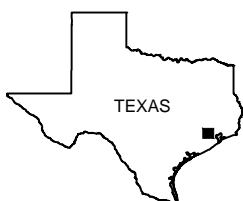
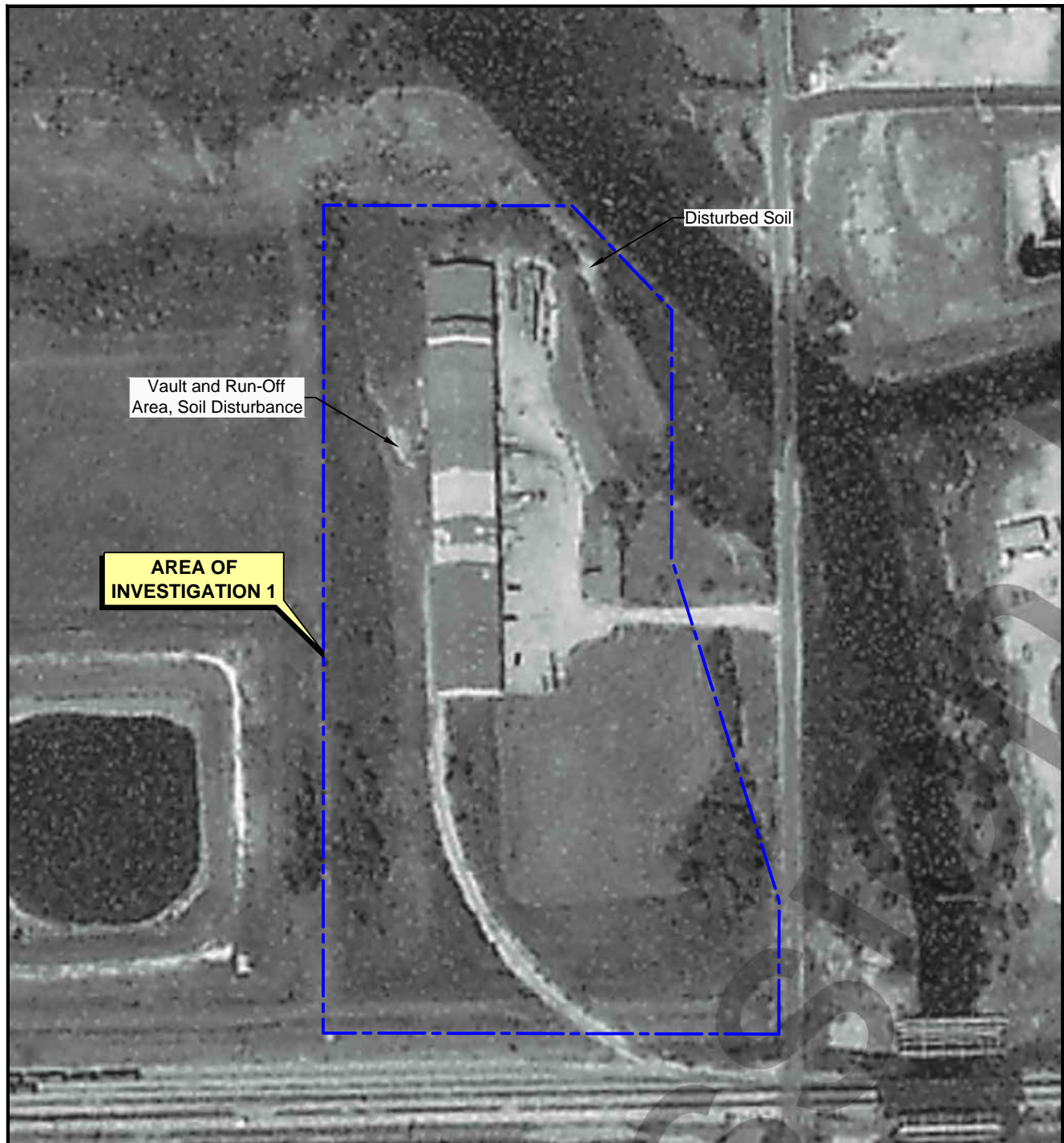
US OIL RECOVERY
PASADENA, TEXAS

Figure D-1-7

1979 AERIAL PHOTOGRAPH

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AERIAL PHOTO LOCATION



Approx. Scale In Feet
0 100 200

SOURCE:
Base map from EDR Report dated August 13, 2012, Pasadena, TX.

US OIL RECOVERY
PASADENA, TEXAS

Figure D-1-8

1989 AERIAL PHOTOGRAPH

PROJECT: 1863

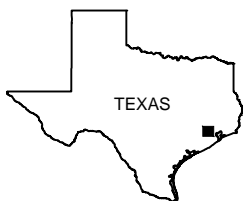
BY: AJD

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AERIAL PHOTO LOCATION



Approx. Scale In Feet
0 100 200

SOURCE:
Base map from Google Earth, dated January 1995.

US OIL RECOVERY
PASADENA, TEXAS

Figure D-1-9

1995 AERIAL PHOTOGRAPH

PROJECT: 1863

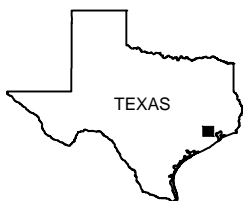
BY: AJD

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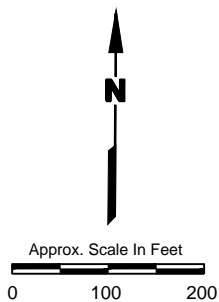
DATE: APRIL, 2014

CHECKED: MKW

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AERIAL PHOTO LOCATION



SOURCE:
Base map from EDR Report dated August 13, 2012, Pasadena, TX.

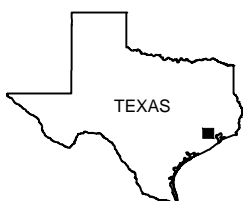
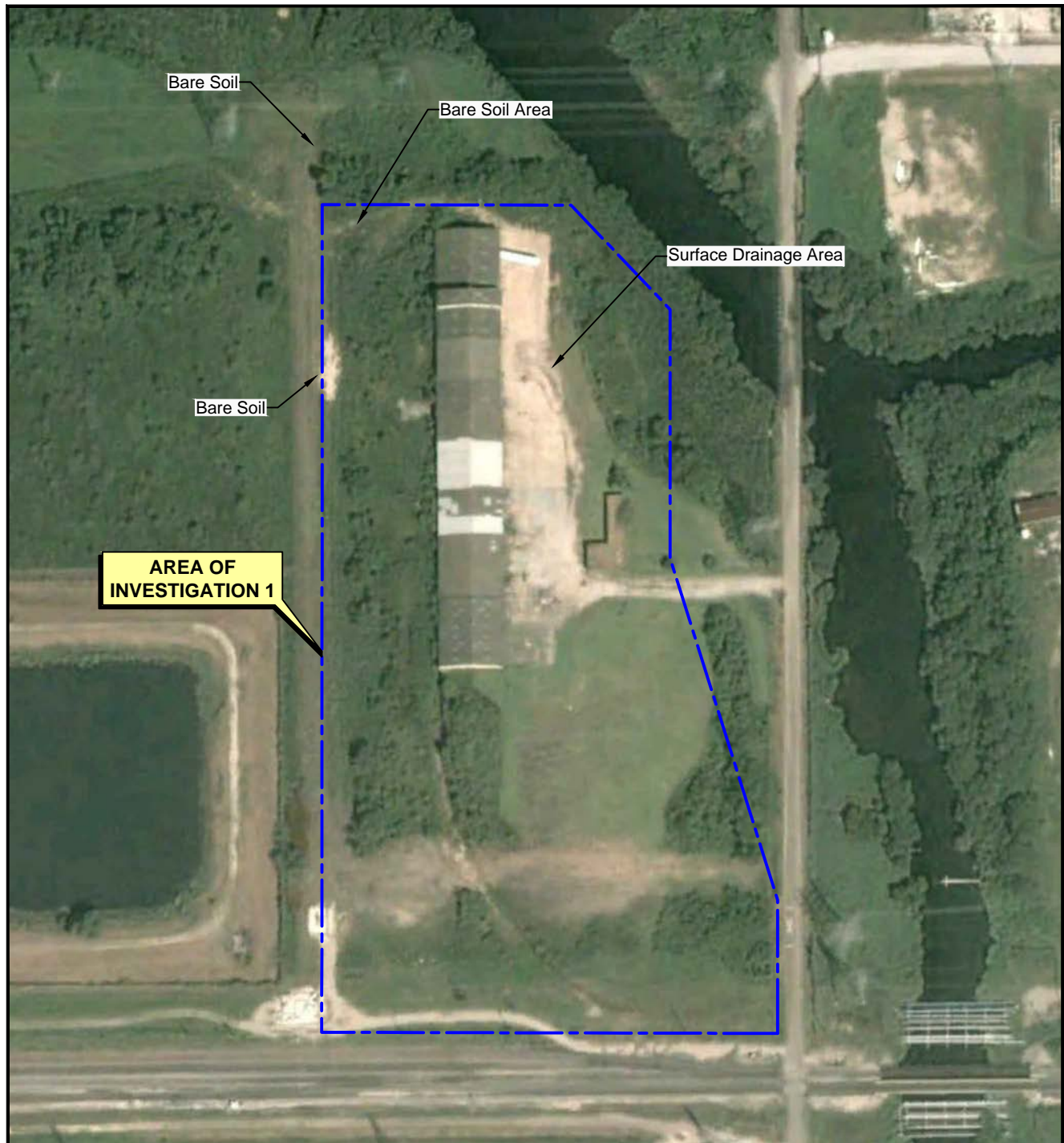
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Figure D-1-10

1995 AERIAL PHOTOGRAPH

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AERIAL PHOTO LOCATION



Approx. Scale In Feet
 0 100 200

SOURCE:
 Base map from Google Earth, dated October 2002.

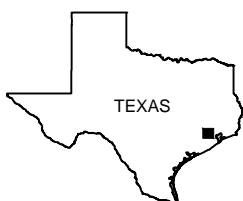
US OIL RECOVERY
PASADENA, TEXAS

Figure D-1-11

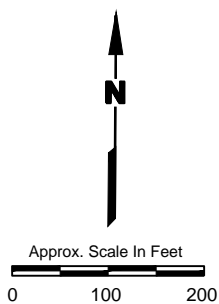
2002 AERIAL PHOTOGRAPH

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AERIAL PHOTO LOCATION



SOURCE:
Base map from Google Earth, dated February 2004.

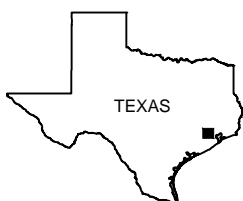
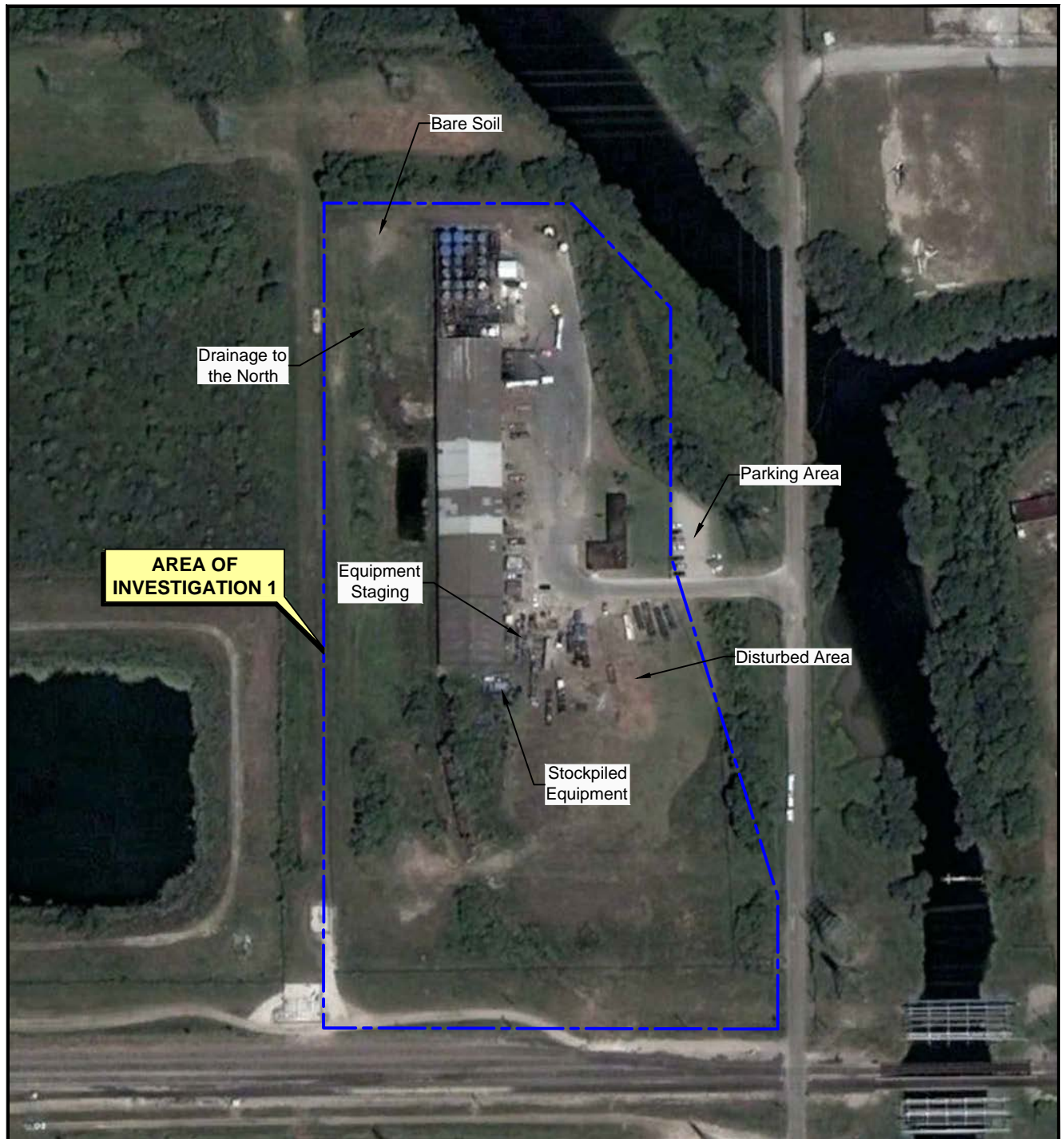
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Figure D-1-12

2004 AERIAL PHOTOGRAPH

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AERIAL PHOTO LOCATION



Approx. Scale In Feet
0 100 200

SOURCE:
Base map from Google Earth, dated April 2005.

US OIL RECOVERY
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Figure D-1-13

2005 AERIAL PHOTOGRAPH

PROJECT: 1863

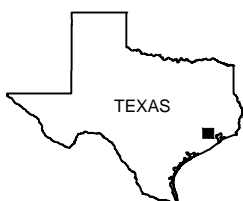
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AERIAL PHOTO LOCATION



Approx. Scale In Feet
 0 100 200

SOURCE:
 Base map from Google Earth, dated January 2006.

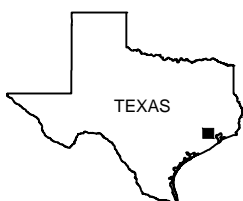
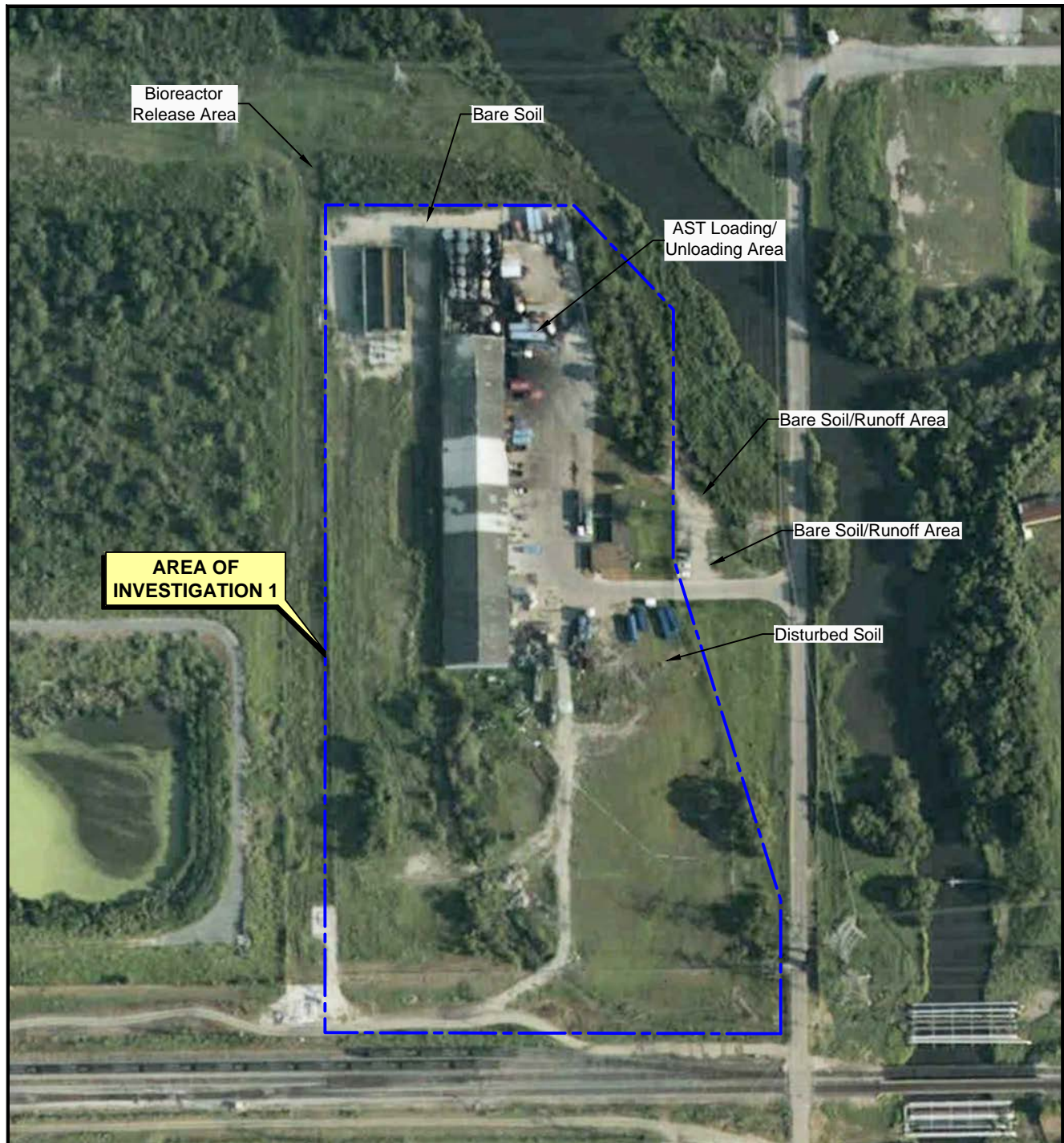
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Figure D-1-14

2006 AERIAL PHOTOGRAPH

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AERIAL PHOTO LOCATION



Approx. Scale In Feet
0 100 200

SOURCE:
Base map from Google Earth, dated September 2007.

US OIL RECOVERY PASADENA, TEXAS

Figure D-1-15

2007 AERIAL PHOTOGRAPH

PROJECT: 1863

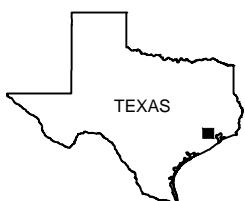
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AERIAL PHOTO LOCATION



Approx. Scale In Feet

0 100 200

SOURCE:
Base map from Google Earth, dated January 2008.

US OIL RECOVERY
PASADENA, TEXAS

Figure D-1-16

2008 AERIAL PHOTOGRAPH

PROJECT: 1863

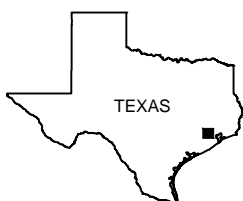
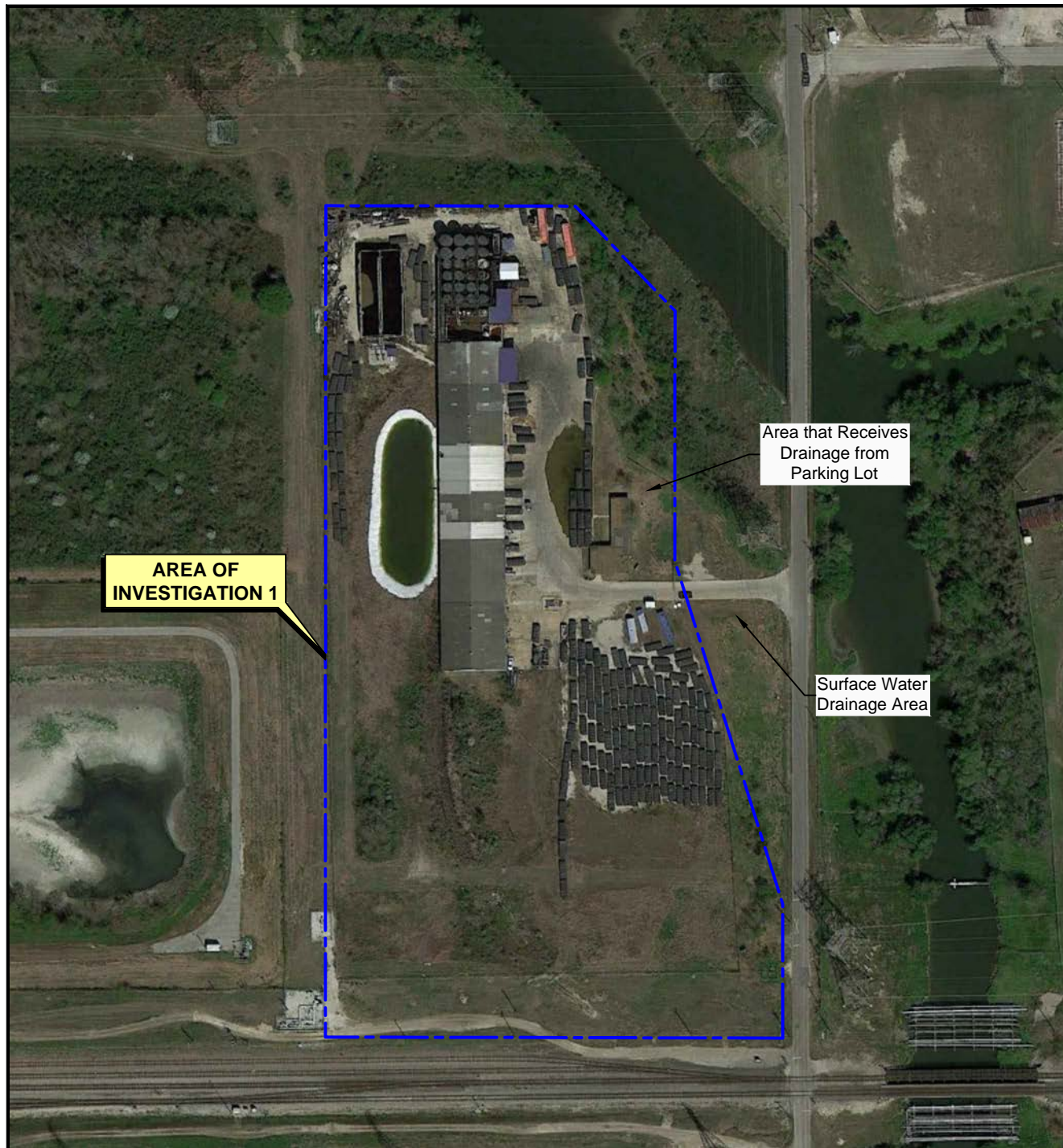
BY: AJD

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AERIAL PHOTO LOCATION



Approx. Scale In Feet
0 100 200

SOURCE:
Base map from Google Earth, dated March 2012.

US OIL RECOVERY
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Figure D-1-17

2011 AERIAL PHOTOGRAPH

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